Int.J.Curr.Microbiol.App.Sci (2019) *8*(10): 1173-1179

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 10 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.810.137

Effect of Different Levels of Nitrogen and Weed Management Practices on Weed Parameters of Gaillardia (*Gaillardia pulchella* Foug.) under Hyderabad Conditions

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Keywords

Gaillardia, Nitrogen, Weeds, Mulching, Weed control efficiency

Article Info

Accepted:
10 September 2019
Available Online:
10 October 2019

A B S T R A C T

Weed management in crops through hand weeding is facing a tough challenge in many developing countries like India where workers are migrating from rural to urban areas in search of better job and lifestyle opportunities. Manual weeding option is facing acute shortage of labour. The present investigation was therefore carried out to study the effect of different levels of nitrogen and weed management practices on weed parameters of gaillardia (*Gaillardia pulchella* Foug.) under Hyderabad conditions and it was carried out during the year 2018-2019 at Floricultural Research Station, Hyderabad. The experiment was laid out in FRBD comprising of 20 treatment combinations with three replications. Minimum weed count per square meter (15.59 and 2.16), dry weight of weeds (2.34 g and 0.71 g) was observed in 180 kg N/ha and mulching with black and silver polythene mulch. Weed control efficiency was maximum (62.70 % and 94.944%) in treatment 180 kg N/ha and mulching with black and silver polythene mulch.

Introduction

Gaillardia pulchella, also known as blanket flower or fire-wheel is one of the important bedding and loose flower plants grown across the globe. It is hardy, short-lived perennial and grown under a variety of soil and climatic conditions. The genera have over two dozen species which are mostly native to North America (Bailey, 1947). As a bedding plant, it is grown in pots, mixed containers and borders for short time display while the whole flowering stem is marketed as a cut flower for bouquets (Armitage, 1992). Gaillardia provides sizzling summer color to the garden with striking blooms in combinations of red, yellow and orange offset by deep brown centers.

Success in any crop production technology depends on thorough weed management practices. Weeds are of special significance when the gaillardia is grown in the field for commercial production. Weeds cause heavy

damage to this crop by competing with main plants for water, nutrients, light and space besides acting as alternate hosts to a number of pathogens and pests. Hence, for protection of this commercially important crop, proper weed control is of utmost significance. Cultural and use of chemical are the most effective methods as compared to the physical method. Black polyethylene mulches offer complete weed control and increase the temperature of the air and soil environment close to the plant as a result of the mulch's absorption of solar radiation (Jenni *et al.*, 2004).Herbicides constitute a highly efficient technique for controlling weeds hence increasing yields, improving quality and reducing labour in crop production (Sill, 1982).

Therefore, the present investigation was carried out to assess the effect of different levels of nitrogen and weed management practices on weed parameters of gaillardia crop.

Materials and Methods

The present experiment was conducted at Floricultural Research station, Agricultural Research Institute, Rajendranagar, Hyderabad. It was laid out in Factorial Randomized Block Design comprising of twenty treatments with cultivar Local Red (yellow tip) with three replications. The treatments consisted of four nitrogen levels i.e. 0 Kg N/ha (N_1), 75 Kg N/ha (N_2), 150 Kg N/ha (N_3), 180 Kg N/ha (N_4) and five weed management practices i.e, Black and silver polythene mulch (40 microns) (T_1) Paddy straw mulch (T_2), Pendimethalin 1kg *a.i.* /ha + weeding 30 DAT (T_3), Weed free control (T_4), Control (without weeding) (T_5). The size of the size of the bed was 1.8 × 0.9 m with a spacing 30 × 45 cm. Forty five days old seedlings were transplanted on 2nd fortnight of September and all the recommended package of practices were adopted systematically.

To record observations on weed count, weeds removed from 0.25 m^2 area in a randomly marked spots in each plot at 20 days interval after application was considered. After counting, the weeds they were oven dried at 65^0-70^0Cfor 48 hrs and dry weight were recorded. Weed control efficiency (W.C.E) was calculated on dry weight basis by adopting the following formula (Mani *et al.*, 1976).

$$\text{WCE} = \frac{DWC - DWT}{DWC} \times 100$$

Where,

WCE = Weed control efficiency
DWC = Dry weight of weeds in weedy check plot
DWT = Dry weight of weeds in treated plot

Five plants were selected randomly from each treatment, tagged and recorded growth parameters viz., number of weeds per square meter, weed control efficiency and dry weight of weeds. The observations were statistically analyzed.

Results and Discussion

The data related to number of weeds per square meter, weed control efficiency and dry weight of weeds are presented in table 1, 2 and 3.

Weed parameters

Number of weeds per meter square

Data on weed count were recorded at 20, 40 DAT and is presented in Table 1.

20 DAT

At 20 DAT the treatment (N_4)180 kg N/ha (19.09) recorded minimum no. of weeds which was on par with (N_2)150 kg N/ha

(19.86) were significantly superior to (N_1) 0 kg N/ha (21.06). The highest weed count was noticed in (N_2)75kg nitrogen/ha (22.39).

It is quite evident from the data that significant differences were observed among the different weed control treatments for weed count at 20 DAT. It is quite evident from the data that at early stage of crop growth i.e., 20 DAT, the mulching with (T_1) black and silver polythene mulch (6.33) significantly reduced the weed population as compared to plots where other treatments were imposed i.e. pendimethalin @ 1kg *a.i.* /ha + weeding 30 DAT (10.08), (T_2) paddy straw mulch (15.33) and (T_4) weed free control (34.08) and maximum was recorded with (T_5) control (without weeding) (37.12). Similar results are obtained with Jadhav *et al.*, (2018)

40 DAT

At 40 DAT least no. of weeds was noticed in (N_4)180 kg N/ha (15.59) followed by (N_2)150 kg N/ha (16.60), (N_1) 0 kg N/ha (17.33), (N_2)75kg N/ha (18.66). The highest weed count was noticed in (N_2)75kg N/ha (18.66). Weed count was lower with increase in nitrogen level due to uptake of nitrogen was maximum in Gaillardia plant with good growth than the weeds.

Data recorded at 40 DAT, treatment (T_1) black and silver polythene mulch (2.16) recorded lower weed count and followed by treatment (T_2) pendimethalin at 1kg *a.i.* /ha + weeding 30 DAT (7.68), (T_2) paddy straw mulch (8.33) and (T_4) weed free control (24.08) and higher weed count was recorded with (T_5) control (without weeding) (42.99).

Among the different treatments, very less weed infestation was recorded under black and silver polythene mulch. This might be due to the black colour of the polythene absorbed all the incident radiation itself. Therefore no light penetration occurred through the polythene mulch which ultimately checks the weed seed germination and growth. Similar observations were reported in rose by Kumar and Chakraborty (2010).

Spreading habit of gaillardia controlled maximum weeds within in 40 DAT. Due to the spreading habit there was less competition of weeds for sunlight and space.

Weed Control Efficiency (WCE **%)**

Weed control efficiency (WCE) can be worked out considering dry matter production of weeds. Data on weed control efficiency under different nitrogen levels, weed management practices and interaction have been given in table 2 and figure 1.

The results revealed that nitrogen at different levels has no significant influence on Weed control efficiency of Gaillardia. Among various weed control treatments, WCE was found to be significantly higher in treatment (T_1) black and silver polythene mulch (94.94 %) followed by (T_3) pendimethalin at 1kg *a.i.* /ha + weeding 30 DAT (78.79 %).

However, the lowest weed control efficiency (0.00 %) was observed in (T_5) control (without weeding) due to maximum number of weeds.

Among all the treatment maximum WCE was recorded in treatment mulching with black and silver polythene mulch. Similar results were also reported by Shalini and Patil (2006) in gerbera, Chawla (2008) in African marigold, Solaiman *et al.*, (2008) in Aster, Kumar and Chakraborty (2010) in rose.

Higher weed control efficiency under these treatments can accounted to lower dry weight of weeds in these treatments. The lowest weed control efficiency was observed in control due to no control of weeds.

Table.1 Effect of nitrogen levels, weed management practices and their interaction on number of weeds per square meter of Gaillardia Cv. Local red (with yellow tip)

Treatment	Number of weeds/ m^2									
	20 DAT					40 DAT				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
T_1	7.00	6.68	6.00	5.67	**6.33** [a]	2.66	2.33	2.00	1.67	**2.16** [a]
T_2	17.68	15.66	14.33	13.67	**15.33** [c]	9.66	8.33	7.00	5.66	**7.68** [b]
T_3	11.65	10.01	9.66	9.00	**10.08** [b]	10.00	8.00	7.67	7.68	**8.33** [b]
T_4	35.66	34.66	33.66	32.33	**34.08** [d]	26.10	24.33	23.68	22.33	**24.08** [c]
T_5	40.00	38.33	35.67	34.81	**37.12** [e]	45.02	43.67	42.66	40.63	**42.99** [d]
Mean	**22.39** [b]	**21.06** [b]	**19.86** [a]	**19.09** [a]		**18.66** [c]	**17.33** [b]	**16.60** [b]	**15.59** [a]	
For comparing the means of	**SEm±**		**CD @ 5%**			**SEm±**		**CD @ 5%**		
N (Factor A)	0.64		1.85			0.32		0.94		
T (Factor B)	0.72		2.07			0.36		1.10		
N X T	1.44		NS			0.73		NS		

Table.2 Effect of nitrogen levels, weed management practices and their interaction on weed control efficiency of Gaillardia Cv. Local red (with yellow tip)

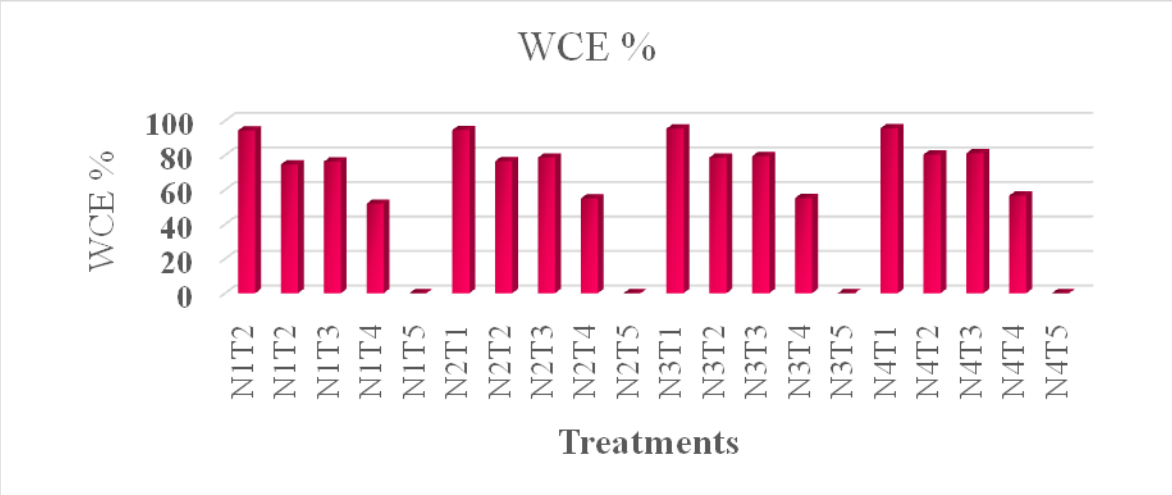
Treatment	WCE % at 40DAT				
	N_1	N_2	N_3	N_4	Mean
T_1	94.29	94.52	95.32	95.61	**94.94** [a]
T_2	74.59	76.49	78.56	80.35	**77.50** [b]
T_3	76.19	78.55	79.37	81.05	**78.79** [b]
T_4	51.83	54.85	55.08	56.50	**54.52** [c]
T_5	0	0	0	0	**0**
Mean	**59.34**	**60.88**	**61.66**	**62.70**	
For comparing the means of	**SEm±**			**CD @ 5%**	
N (Factor A)	1.06			NS	
T (Factor B)	1.19			3.41	
N X T	2.38			NS	

Table.3 Effect of nitrogen levels, weed management practices and their interaction on dry weight of weeds

Treatment	Dry weight of weeds(g/m^2)									
	20 DAT					40 DAT				
	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean
T1	2.14	2.42	1.80	1.57	**1.98**	0.77	0.80	0.66	0.57	**0.71**
T2	5.08	6.38	4.52	4.27	**5.06**	3.32	3.67	2.89	2.62	**3.13**
T3	3.35	3.79	3.27	3.15	**3.39**	3.20	3.29	2.91	2.70	**3.02**
T4	9.46	10.01	9.32	8.94	**9.43**	6.19	6.94	6.38	5.80	**6.33**
T5	0	0	0	0	**0**	0	0	0	0	**0**
Mean	**4.01**	**4.52**	**3.78**	**3.58**		**2.69**	**2.94**	**2.56**	**2.34**	
For comparing the means of	**SEm±**		**CD @ 5%**			**SEm±**		**CD @ 5%**		
N	0.22		0.63			0.13		0.38		
T	0.24		0.71			0.15		0.43		
N X T	0.49		NS			0.30		NS		

N: Nitrogen, T: weed management practices, N × T: Nitrogen and weed management practices
N_1: 0kg/ha, N_2: 75kg/ha, N_3: 150kg/ha, N_4: 180kg /ha
T_1: Black and silver polythene mulch (40 microns), T_2: Paddy straw mulch, T_3: Pendimethalin 1kg *a.i*/ha + weeding 30DAT, T_4: Weed free control, T_5: Control (without weeding).

Fig.1 Effect of nitrogen levels, weed management practices and their interaction on weed control efficiency at 40 DAT of Gaillardia Cv. Local red (with yellow tip)



Dry weight of weeds (g)

The data pertaining to dry weight of weeds at different stages of the crop growth was presented in Table 3.

20 DAT

At 20 DAT the treatment (N_4)180 kg N/ha (3.58 g) recorded minimum dry weight of weeds followed by (N_2)150 kg N/ha (3.78 g) and both were on par with each other, and were significantly superior to all other treatments *viz*, (N_1) 0 kg N/ha (4.01 g), (N_2)75kg N/ha (4.52 g). The highest dry weight was noticed in (N_2)75kg N/ha (4.52 g).

The observations recorded at 20 DAT, treatment (T_1) Black and silver polythene mulch (1.98 g) showed significantly lower dry weight of weeds than others which was followed by (T_3) pendimethalin @ 1kg *a.i.* /ha + weeding 30 DAT (3.39 g), (T_2) paddy straw mulch recorded (5.06 g). In (T_5) control (without weeding) weeding was not done.

40 DAT

At 40 DAT least dry weight of weeds was noticed in (N_4)180 kg nitrogen/ha (2.34 g) followed by (N_2)150 kg nitrogen/ha (2.56 g) and both were significantly superior to other treatments *viz*, (N_1) 0 kg nitrogen/ha (2.69 g), (N_2)75kg nitrogen/ha (2.94 g). The highest dry weight of weeds was noticed in (N_2)75kg nitrogen/ha (2.94 g).

Data recorded at 40 DAT, treatment (T_1) black and silver polythene mulch (0.71 g) recorded lower dry weight of weeds and followed by treatment (T_3) pendimethalin at 1kg *a.i.* /ha + weeding 30 DAT (3.02 g), (T_2) paddy straw mulch (3.13 g) while (T_4) was recorded maximum (6.33 g) in weed free treatment.

There is no significant difference in the interaction effect of different levels of nitrogen and weed management practices on no. of weeds at 20 DAT and 40 DAT, weed control efficiency, dry weight of weeds.

On the basis of the results of the present investigation, it can be concluded that, among the nitrogen levels and weed management practices, application of 180 kg N/ha and plots mulched with black and silver polythene mulch had good control over weeds and the plots under these treatments has good growth, highest flower yield with good quality flowers.

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How to cite this article:

Prashamsha, G., P. Prasanth and Seenivasan Natarajan. 2019. Effect of Different Levels of Nitrogen and Weed Management Practices on Weed Parameters of Gaillardia (*Gaillardia pulchella* Foug.) under Hyderabad Conditions. *Int.J.Curr.Microbiol.App.Sci.* 8(10): 1173-1179. doi: https://doi.org/10.20546/ijcmas.2019.810.137