International Journal of Environment and Climate Change

Volume 13, Issue 9, Page 1488-1492, 2023; Article no.IJECC.103321
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Effect of Integrated Weed Management Practices on Growth and Yield of Onion (*Allium cepa* L.)

Ch. Shravani [a*], Y. S. Parameswari [a], M. Madhavi [a] and T. Ram Prakash [b]

[a] Department of Agronomy, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana-500030, India.
[b] AICRP on Weed Management, DJB, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana-500030, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2023/v13i92380

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/103321

Original Research Article

Received: 10/05/2023
Accepted: 12/07/2023
Published: 19/07/2023

ABSTRACT

A field experiment was conducted to study the effect of integrated weed management practices on growth and yield of onion at College Farm, Professor Jayashanker Telangana State Agricultural University, Rajendranagar, Hyderabad in *Rabi* 2021. The experiment consisted of eleven treatments and laid out in randomised block design (RBD) with 3 replications. Results revealed that growth parameters *viz*., plant height and number of leaves per plant were significantly influenced by weed management practices. Significantly high growth parameters were recorded with mechanical weeding at 20 and 40 DAT and it was at par with pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch and oxyfluorfen 23.5% EC 100 g ha^{-1} PE + polyfilm mulch. Similarly, higher yield was recorded with mechanical weeding at 20 and 40 DAT (183.2 q ha^{-1}) and it was on par with pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch (176.3 q ha^{-1}) and oxyfluorfen 23.5%

**Corresponding author: E-mail: reddy.shravanireddy@gmail.com;*

EC 100 g ha^{-1} PE + polyfilm mulch T_2 (173.2 q ha^{-1}). On the other hand, lower growth parameters and yield was recorded in unweeded treatment. Hence it can be concluded that mechanical weeding at 20 and 40 DAT or pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch or oxyfluorfen 23.5% EC 100 g ha^{-1} PE + polyfilm mulch may be adopted for better growth and yield in onion.

Keywords: Integrated weed management; onion; mechanical weed control; pendimethalin; oxyfluorfen; polyfilm mulch.

1. INTRODUCTION

Vegetable crops in India are vital for food and nutritional security. India being the largest in area, second in production and third in export of such crops, however there is an urgent requirement to boost vegetable production to meet the increasing demands of the population. Among the various vegetables, onions hold great significance as they are an essential component of many diets and are a key ingredient in numerous recipes. Onion bulb is rich in phosphorus, calcium and carbohydrates. "Onions contain antioxidants and compounds that fight against inflammation, decrease triglycerides and reduce cholesterol levels all of which may lower heart disease risk. In India, it is grown in an area of 1.6 m ha with a total production of 26.83 million tonnes having an average productivity of 16.4 t ha^{-1}, onions" [1].

"Weeds pose a significant challenge to the successful cultivation of onions. Numerous studies have indicated that onions have a limited ability to compete with weeds. Uncontrolled weed growth reduces the bulb yield upto 40-80% depending upon the nature of intensity and duration of weed competition in onion field" [2]. "The poor competitive ability of onions is due to short height, lack of branching, sparse foliage, shallow root system, and extremely slow initial growth" [3]. Manual weeding in onion cultivation is costly, time-consuming, and requires frequent repetition. The unavailability of timely labour leads to ineffective weed control, resulting in reduced onion yields. Taking these points into consideration, the study was planned to find out effective integrated weed management practice to get higher yield of onion.

2. MATERIALS AND METHODS

The field experiment was carried out during *rabi* 2021-22, at College Farm, College of Agriculture, Rajendranagar, Professor Jayashankar Telangana State Agriculture University, Hyderabad. The soil of experimental site was sandy loam in texture with pH 7.1, medium in organic carbon (0.71 %), low in available nitrogen (233.7 kg ha^{-1}), high in available Phosphorus (32.71 kg ha^{-1}) and medium in Potassium (334.24 kg ha^{-1}). The experiment consisted of 11 weed control treatments which were laid out in randomized block design with three replications. T1: Oxyfluorfen 23.5% EC 100 g ha^{-1} pre-emergence (PE) + mechanical weeding at 30 DAT (Days after transplanting), T2: Oxyfluorfen 23.5% EC 100 g ha^{-1} PE + polyfilm mulch, T3: Pendimethalin 38.7% CS 677.25 g ha^{-1} PE + mechanical weeding at 30 DAT, T4: Pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch, T5: Stale seed bed *fb* propaquizafop 5% + oxyfluorfen 12% EC 148 g ha^{-1} post-emergence (PoE), T6: Stale seed bed *fb* quizalofop ethyl 4%+ oxyfluorfen 6% EC 100 g ha^{-1} PoE, T7: Pendimethalin 38.7% CS 677.25 g ha^{-1} PE *fb* propaquizafop 5%+ oxyfluorfen 12 % EC 148 g ha^{-1} PoE, T8: Pendimethalin 38.7% CS 677.25 g ha^{-1} PE *fb* quizalofop ethyl 4% + oxyfluorfen 6% EC 100 g ha^{-1} PoE, T9: Pendimethalin 38.7% CS 677.25 g ha^{-1} PE and intercrop with fenugreek, T10: Mechanical weeding at 20 and 40 DAT and T11: Weedy check. Bhima super (a red onion variety) seedlings were transplanted on 10th November, 2021 with a spacing of 30×10 cm. On the same day, fenugreek variety, Pusa early bunching sowing was taken up in respective treatment plots along with onion transplanting. A common fertilizer dose of 80 kg N, 32 kg P_2O_5 ha^{-1}and 24 kg ha^{-1} K_2O were applied to the field in the form of urea, SSP and MOP. In treatments involving stale seed bed, frequent irrigations were given for germination of weed flora and the entire weed flora germinated was uprooted by manual weeding prior to transplanting. A black polyethylene sheet of 30 mm gauge thickness was cut fixed between inter-rows of crop and fastened with the help of wooden pegs one week after transplanting. Pre emergence herbicides were applied within 24 hours after transplanting. Post emergence herbicides were applied at 2-3 leaf stage of weeds. At the time of application it was ensured that sufficient moisture was

maintained in the soil. The herbicide spraying was done through knapsack sprayer using 500 liters of water per hectare. Biometric observations were taken on tagged five representative plants selected at random from each treatment of net plot and the mean values were presented.

3. RESULTS AND DISCUSSION

3.1 Plant Height (cm)

There was no significant effect of different weed management practices on height of onion plant at 20 DAT. However, at 40 and 60 DAT, the plant height varied significantly in response to different weed management treatments. It ranged from 30.06 cm to 64.17 cm. The higher plant height was recorded with mechanical weeding at 20 and 40 DAT which was statistically on par with the pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch, oxyfluorfen 23.5% EC 100 g ha^{-1} PE + polyfilm mulch (Table 1). This was followed by pendimethalin 38.7% CS 677.25 g ha^{-1} PE *fb* propaquizafop 5%+ oxyfluorfen 12 % EC 148 g ha^{-1} PoE, pendimethalin 38.7% CS 677.25 g ha^{-1} PE *fb* quizalofop ethyl 4% + oxyfluorfen 6% EC 100 g ha^{-1} PoE, pendimethalin 38.7% CS 677.25 g ha^{-1} PE + mechanical weeding at 30 DAT, oxyfluorfen 23.5% EC 100 g ha^{-1} PE + mechanical weeding at 30 DAT and are statistically at par with one another. However, weedy check recorded significantly lower plant height over all the treatments. The superior values of plant height was due to better control of weeds resulting in lesser crop weed competition, providing suitable environment for expression of growth . Similar observations were also reported by Sahu et al. [4].

3.2 Number of Leaves per Plant

Number of leaves in onion plant was not influenced by integrated weed management practices at 20 DAT. At 40 and 60 DAT, mechanical weeding at 20 and 40 DAT recorded significantly higher number of leaves per plant at various growth stages but remained comparable with pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch and oxyfluorfen 23.5% EC 100 g ha^{-1} PE + polyfilm mulch. These treatments were followed by pendimethalin 38.7% CS 677.25 g ha^{-1} PE *fb* propaquizafop 5%+ oxyfluorfen 12 % EC 148 g ha^{-1} PoE, pendimethalin 38.7% CS 677.25 g ha^{-1} PE *fb* quizalofop ethyl 4% + oxyfluorfen 6% EC 100 g ha^{-1} PoE, pendimethalin 38.7% CS 677.25 g ha^{-1} PE + mechanical weeding at 30 DAT and oxyfluorfen 23.5% EC 100 g ha^{-1} PE + mechanical weeding at 30 DAT. Stale seed beds treated with post emergence herbicides *i.e*., T_5 and T_6 recorded the next highest drymatter accumulation which were on par with pendimethalin 38.7% CS 677.25 g ha^{-1} PE *fb* intercrop with fenugreek. The lowest number of leaves was noticed in weedy check. Similar trend was followed at harvest. Highest number of leaves per plant might be due to control of complex weed flora and reduced crop-weed competition which resulted in more vegetative growth. These findings are in agreement with studies of Manjunath et al. [5] and Vishnu et al. [6] in onion.

Table 1. Effect of Integrated Weed Management Practices on Plant Height (cm) in Onion

Treatments	20 DAT	40 DAT	60 DAT
T1	32.50	45.31	54.30
T2	33.10	54.04	62.67
T3	33.60	46.35	55.91
T4	32.90	55.93	63.54
T5	33.70	40.55	49.57
T6	33.20	40.11	48.50
T7	33.30	49.21	57.42
T8	32.50	48.02	56.21
T9	32.30	39.67	47.32
T10	32.60	55.68	64.17
T11	32.70	30.06	39.93
SEm±	0.37	1.50	1.30
CD (p=0.05)	1.11	4.40	4.00

DAT-Days after Transplanting

Table 2. Effect of Integrated Weed Management Practices on Number of Leaves Plant^{-1} in Onion

Treatments	20 DAT	40 DAT	60 DAT	HARVEST
T1	1.98	5.56	8.16	9.31
T2	1.98	6.58	9.25	11.1
T3	1.95	5.60	8.20	9.3
T4	1.88	6.65	9.34	11.3
T5	1.92	4.65	7.31	8.1
T6	1.96	4.63	7.25	7.9
T7	1.97	5.69	8.35	9.9
T8	1.95	5.67	8.24	9.5
T9	1.93	4.14	7.13	7.3
T10	1.92	6.84	9.63	11.3
T11	1.96	2.97	5.25	5.9
SEm±	0.03	0.30	0.30	0.3
CD (p=0.05)	NS	0.80	0.80	0.9

DAT - Days after Transplanting

3.3 Bulb Diameter (cm) and Yield (kg ha^{-1})

Mechanical weeding at 20 and 40 DAT registered significantly higher bulb diameter which was found statistically at par with pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch and oxyfluorfen 23.5% EC 100 g ha^{-1} PE + polyfilm mulch. The lowest bulb diameter was recorded in weedy check. The higher bulb diameter may be attributed due to proper weed management practices which reduced the weeds effectively, thus helped in faster growth and development of onion bulbs. These findings are analogous to those obtained by Vishnu et al. [6].

Integrated weed management practices significantly influenced bulb yield. Mechanical weeding at 20, 40 DAT (183 q ha^{-1}) recorded significantly higher yield and it was on par with pendimethalin 38.7% CS 677.25 g ha^{-1} PE + polyfilm mulch (176 q ha^{-1}) and oxyfluorfen 23.5% EC 100 g ha^{-1} PE + polyfilm mulch treated plots (173q ha^{-1}). Maximum yield in mechanical weeding treatment might be due to favourable environment created by clean crop culture resulting in more absorption of solar radiation and plant nutrients resulting in more photosynthetic rates and more dry matter accumulation. The results are similar to the findings of Rahman et al. [7] and Sinare et al. [8] in onion [9-11].

Table 3. Effect of Integrated Weed Management Practices on Bulb Diameter (cm) and Bulb Yield (q ha^{-1}) in Onion

Treatments	Bulb Diameter	Bulb Yield
T1	5.5	122
T2	7.2	173
T3	5.6	126
T4	7.3	176
T5	4.3	92
T6	4.2	91
T7	6.1	149
T8	5.8	146
T9	4.0	77
T10	7.5	183
T11	2.4	22
SEm±	0.3	8.0
CD (p=0.05)	0.8	23.5

4. CONCLUSIONS

Results of the study revealed that mechanical weeding at 20 DAT and 40 DAT *i.e*., during the critical crop growth period had reduced the weed competition for the crop and produced more yield and net returns. Besides pre-emergence herbicide spray along with polyfilm mulch had produced the similar results indicating them as equally effective in suppressing the weeds. It can be concluded that instead of adopting single method of weed control in onion, combination of weed control measures could yield better results in terms of both production and profit.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Indiastat. Annual report on onion area, production and productivity in India; 2022.
2. Tewari AN, Tiwari SN, Rathi JPS, Singh B, Tripathi AK. Studies on crop-weed competition in kharif onion (*Allium cepa* L.). Indian Journal of Weed Science. 2003; 35(1and2):156-158.
3. Ramalingam SP, Chinnagounder C, Perumal M, Palanisamy MA. Evaluation of new formulation of oxyfluorfen (23.5% EC) for weed control efficacy and bulb yield in onion. Ind J. Agro. 2013;15(2):13-17.
4. Sahu G, Vinoda N, Monisha P, Paradkar V, Kumar N. Studies on drying of osmotically dehydrated onion slices. Int. J. Curr. Microbiol. App. Sci. 2018;6(9):129-141.
5. Manjunatha R, Palled Y.B, Shashidhara G.B, Patil P.L. and Channappagoudar BB. Integrated weed management in transplanted onion (*Allium cepa* L.) under irrigated alfisol. M. Sc.(Agri.) Thesis, University of Agricultural Sciences, Dharwad; 2005.
6. Vishnu V, Asodaria KB, Suthar A. Weed management in *rabi* onion (*Allium cepa* L.). Agri Sci Digest. 2015;35(2): 130-133.
7. Rahman HU, Ullah K, Sadiq M, Zubiar M, Javaria S, Khan MA et al. Relative efficacy of different weed control methods in onion (*Allium cepa* L.) crop. Pakistan Journal of Weed Science Research. 2011;17: 343-350.
8. Sinare BT, Andhale RP, Gautam M. Weed control in onion with herbicides. Ind. Weed Sci. 2014;46(2):192-194.
9. Kalhapure AH, Shete BT, Bodake PS. Integrated weed management in onion (*Allium cepa* L). Indian Journal of Agronomy. 2013;58(3):408-411.
10. Sharma RC, Khandwe R. Response of weed control measures in *kharif* onion. *Res. Crops*. 2008;9:348-349.
11. Verma SK, Singh T,Chakravorty S. Weed control in kharif onion. Indian Journal of Weed Science. 2019;28:48-51.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/103321