International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133, Print ISSN: 2664-7125
Received: 23-12-2021, Accepted: 08-01-2022, Published: 24-01-2022
Volume 4, Issue 1, 2022, Page No. 21-24

Efficacy of different weed management practices in weed control of onion (*Alliumcepa* L.) under central dry zone of Karnataka

Vijaykumar M N, Umamaheswarappa P, Srinivas V, Lakshmana D, Kantharaj Y, Y Rammohan
College of Horticulture, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka, India

Abstract
During Rabi 2020-21, a field experiment was conducted at Zonal Agricultural and Horticultural Research Station, Babbur Farm, Hiriyur, Chitradurga, to investigate the efficacy of different weed management practises in onion. The experiment had nine treatments and was replicated three times in Randomized Complete Block Design. Among the different weed management practices significantly maximum weed control efficiency (79.96 %) was observed in Hand weeding at 15, 30, 45 and 60 days after transplanting (DAT) and minimum weed density (31.00/m^{-2}), fresh weight (53.00 g), dry weight (10.20 g), and weed index (0.00 %) was also observed in the same treatment. These values are statistically on par with the treatment T_6 (Oxyfluorfen 45 % EC @ 0.75 l/ha 3 DAT + hand weeding at 45 DAT) i.e., weed control efficiency (77.16 %), weed density (35.33/m^{-2}), fresh weight (69.67 g), dry weight (10.33 g), weed index (0.53 %) and herbicide efficiency index (40.88 %) was observed highest in T_6. Based on the results obtained from the present investigation, hand weeding at 15, 30, 45 and 60 days after transplanting found to be promising for getting higher onion yield. However due to sever scarcity and non-availability of labours, it is not possible to carry out timely weeding operation in onion. So, the economically viable and comparatively effective weed control was observed in T_6.

Keywords: onion, *weed*, *Alliumcepa L*

Introduction
Onion (*Allium cepa* L.) is one of the most important vegetable crops grown throughout the world. It is said to be native of Central Asia and Mediterranean region. It belongs to economically important family Alliaceae. Among the vegetable crops listed by FAO, onion is second in terms of annual world production. The major onion producing countries are China, India, USA, Turkey, Japan, Iran, Pakistan, Spain and Brazil.
In India, onion was grown on an area of 1,434 thousand hectares with the annual production of 26,738 thousand metric tonnes (Anon., 2019-20) [1]. The major onion producing states are Maharashtra, Karnataka, Gujarat, Bihar, Madhya Pradesh, Andhra Pradesh, Rajasthan, Tamil Nadu and Haryana.
Among many causes of low productivity, onion exhibits greater susceptibility to weed competition as compared to other crops due to its inherent characteristics such as slow germination, extremely slow growth in the initial stages, short stature, non-branching habit, sparse foliage and shallow root system. This favours quick and fast growth of weeds in the initial stages and competition thus tends to be severe. Moreover, use of liberal dose of FYM, fertilizers and frequent irrigations creates favourable conditions for weed growth (Singh *et al.,* 1986) [14]. It is an established fact that weeds compete with crop plants for space, nutrients, moisture and light there by reducing the quality and quantity of yield (Moolani and Sachan, 1966) [9]. If the weeds are present throughout the crop growth period, there may be complete loss of marketable yield. The reduction in bulb yield varies to the extent of 48 to 85 per cent depending upon the duration, intensity of weed growth and weed competition (Bhalla, 1978) [2]. Hand weeding in onion is a common practice in India, but it is a tedious expensive and time consuming task due to closer spacing and shallow root system. Non-availability of labourers during critical period of crop makes hand weeding difficult leading to heavy yield losses. The critical period of crop-weed competition in onion lies between 15-60 days after transplanting (Singh and Singh, 1994) [13]. Hence, managing the weeds meticulously in early stages is an imperative task to get higher weed control efficiency and bulb yield. Hence, this is imperative need to screen out suitable herbicides for weed control in combination with manual weeding in onion. Keeping the above mentioned facts, the present investigation was under taken to find out efficacy and selectivity of various herbicides.

Material and Methods
The experiment was conducted at Zonal Agricultural and Horticultural Research Station, Babbur Farm, Hiriyur, Chitradurga district which is situated in Central dry zone (Zone-4) of Karnataka state between 13°57'32" North latitude and 70°37'38" East longitude at 606 meters above Mean Sea Level (MSL). The experiment was carried out with nine treatments and three replications in Randomized Complete Block Design. Treatment were as

follows: T_1 – Pendimethalin 30% EC @ 1.0 l/ha 3 DAT, T_2 – Oxyflurofen 45% EC @ 0.75 l/ha 3 DAT, T_3 – Quizalofop ethyl 5% EC @ 0.8 l/ha at 30 DAT, T_4 – Hand weeding at 15, 30, 45 and 60 DAT, T_5 – Pendimethalin 30% EC @ 1.0 l/ha 3 DAT + Hand weeding at 45 DAT, T_6 – Oxyflurofen 45% EC @ 0.75 l/ha 3 DAT + Hand weeding at 45 DAT, T_7 – Quizalofop ethyl 5% EC @ 0.8 l/ha at 30 DAT + Hand weeding at 60 DAT, T_8 – Mulching with local grass/ stubbles, T_9 – Control. Observations recorded are weed density, weed control efficiency, fresh weight of weed, dry weight of weed, weed index and herbicide efficiency index.

Weed density

Weeds density in the experimental plots was recorded at harvest. Species wise weed count was made by placing the quadrant with a siz0e of 1.0 m x 1.0 m in whole plot randomly. All the weeds present in the experimental plots were classified under three major group (i) Monocot weeds (ii) Dicot weeds and (iii) Sedges. The number of weeds were counted and the average was worked out.

Fresh and dry weight of weed

Recorded fresh weight of weeds at the time of harvesting of bulb and also recorded dry weight of weeds after full drying in shade. It was expressed in grams.

Weed control efficiency

$$\text{WCE (\%)} = \frac{\text{Dry matter in the unweeded– Dry matter in treated plot (Control)plot}}{\text{Dry matter in the unweeded (control)plot}} \text{ X } 100$$

$$\text{Weed Index} = \frac{X - Y}{X} \text{ X } 100$$

Where, X = Yield from the weed free plot and
Y = Yield from the treatment plot

Herbicide efficiency index

$$\text{HEI} = \frac{\frac{\text{Yield from treated plot} - \text{Yield from control plot}}{\text{Yield from control plot}} \text{ X } 100}{\frac{\text{Dry matter of weeds in treatment plot}}{\text{Dry matter of weeds in control plot}} \text{ X } 100}$$

Method of application

Pre-emergence - The herbicides like Oxyfluorfen and Pendimethalin used in onion for weed control. The pre-emergence application of weedicides was sprayed 3 to 4 days after transplanting instead of before planting to get better results in weed control.

Post-emergence - The herbicides like Oxyfluorfen, Quizalfop- ethyl and Fenoxaprop-p-ethyl were used as post emergence herbicides. Post-emergence was applied 25 DAT to control all types of weeds.

Results and discussion

Weed density

At harvest, the lowest weed density 31.00/m^2 was recorded in the T_4 (Hand weeding at 15, 30, 45 and 60 DAT) and it found to be *on par* with T_6 (T_2+ hand weeding at 45 DAT) 35.33/m^2. Whereas, T_9 (Control) recorded the highest weed density 154.67/m^2. Monocot dicot weeds are observed less due to hand weeding continuously at crop growth stages. Hand weeding is a practical and efficient method of eliminating weeds in cropped and non-cropped lands. It is very effective against annuals, biennials and controls only upper portions of perennials. The treatment hand weeding was effective at critical crop growth period, since the hand weeding disturbed during critical stages of crop growth period which did not allow the weeds to establish. Weed density also observed low in treatment hand weeding at 15,30,45 and 60 DAT because of removal of weeds through hand weeding at different crop growth stages and also due to higher weed control efficiency which is directly proportional to less weed density. These findings are conformity with Kalhapure and Shete (2013), Kalhapure *et al*. (2013), Sable *et al*. (2013), Singh *et al*. (2016) and Islam *et al*. (2020) in onion.

Fresh and dry weight of weed

Among the different treatments, T_4 (Hand weeding at 15, 30, 45 and 60 DAT) recorded the lowest fresh weight of weed 53.00 g and it was *on par* with the T_6 (T_2+ hand weeding at 45 DAT) 69.67 g. Whereas, the highest fresh weight of weed 878.33 g was noticed in T_9 (Control). In dry weight also T_4 (Hand weeding at 15, 30, 45 and 60 DAT) recorded the lowest *i.e.,* 10.20 g and it was *on par* with the T_6 (T_2+ hand weeding at 45 DAT) 10.33 g. Whereas, the highest dry weight of weed 220.67 g was noticed in T_9 **(**Control). This may be due to that

weed population was recorded more in control. In control treatment weeds remain throughout crop period, so it takes all the available nutrients from the soil until its growth period that's why fresh and dry weight was observed highest in control. Similarly, in hand weeding weed population was observed low so fresh and dry weight of weeds are also observed low. These results are similar with the Chandrika *et al*. (2009) [3], Kalhapure and Shete (2013), Kalhapure *et al*. (2013), Vishnu *et al*. (2015) [17], Singh *et al*. (2016), Vijayvergiya *et al*. (2018) and Islam *et al*. (2020) in onion.

Weed control efficiency

At harvest, the highest weed control efficiency 79.96 per cent was recorded in the T_4 (Hand weeding at 15, 30, 45 and 60 DAT), which was *on par* with T_6 (T_2+ hand weeding at 45 DAT) 77.16 per cent. Whereas, T_9 (Control) recorded the lowest weed control efficiency zero per cent. The effective control of weeds under these treatments may be due to minimum weed dry matter that ultimately resulted in highest weed control efficiency at 30, 45 and 60 DAP. Similar results were noticed by Chandrika *et al*. (2009) [3], Kalhapure and Shete (2013), Kalhapure *et al*. (2013), Sable *et al*. (2013), Vishnu et al. (2015) [17], Singh *et al*. (2016), Vijayvergiya *et al*. (2018) [16] and Islam *et al*. (2020) [5] in onion.

Weed index

Among the different treatments, T_4 (Hand weeding at 15, 30, 45 and 60 DAT) recorded the lowest weed index zero per cent and it was *on par* with the T_6 (T_2+ hand weeding at 45 DAT) 0.53 per cent. Whereas, the highest weed index 65.79 per cent was noticed in T_9 (Control). This might be due to that better control of weeds at initial and later stages of crop growth. This enable the crop to utilize available nutrients, moisture and space more effectively which resulted in better growth and development and ultimately increased flower yield. The maximum weed index indicating yield reduction due to weed competition in control treatment. This may be due to presence of maximum number of weeds, which compete with crop. This is in conformity with findings of Singh *et al.* (1997), Kathepuri *et al.* (2007) and Sharma *et al.* (2009) [11] in onion and Chopra *et al*. (2014) [4] in garlic.

Herbicide efficiency index

Among the different treatments, T_6 (T_2+ hand weeding at 45 DAT) recorded the highest herbicide efficiency index 40.88 per cent and it was followed by the T_7 (Quizalofop ethyl 5% EC @ 0.8 l/ha at 30 DAT + hand weeding at 60 DAT at 45 DAT) 17.01 per cent. Whereas, the lowest herbicide efficiency index 6.91 per cent was noticed in T_1 (Pendimethalin 30% EC @ 1.0 l/ha 3 DAT). This could be due to Oxyfluorfen inhibits root and shoot growth of weed and also photoporphyrinogen oxidase, leading to irreversible cell membrane damage. So that weed population will become low and thus it resulted in higher herbicide efficiency index. These results are similar with the finding of Sharma *et al.* (2009) [11] in onion.

Conclusion

Based on the results obtained from the present investigation, hand weeding at 15, 30, 45 and 60 days after transplanting found to be promising for better control of weeds onion. However due to sever scarcity and non-availability of labours, it is not possible to carry out timely weeding operation in onion. So, the economically viable and comparatively effective weed control was observed in treatment with Oxyfluorfen 45% EC @ 0.75 l/ha 3 DAT+ hand weeding at 45 days after transplanting.

Table 1: Weed density and Weed control efficiency influenced by different weed management practices of onion *cv*. Bhima Shakti.

Treatments	Weed density (m^{-2})	Weed control efficiency (%)
T_1– Pendimethalin 30% EC @ 1.0 l/ha 3 DAT	58.67 (7.72)	62.08
T_2– Oxyfluorfen 45% EC @ 0.75 l/ha 3 DAT	52.33 (7.3)	66.16
T_3– Quizalofop ethyl 5% EC @ 0.8 l/ha at 30 DAT	44.67 (6.76)	71.09
T_4– Hand weeding at 15, 30, 45 and 60 DAT	31.00 (5.65)	79.96
T_5– T_1+ Hand weeding at 45 DAT	41.33 (6.5)	73.28
T_6– T_2+ Hand weeding at 45 DAT	35.33 (6.03)	77.16
T_7– T_3+Hand weeding at 60 DAT	38.33 (6.27)	75.25
T_8– Mulching with local grass/ stubbles	104.33 (10.26)	32.54
T_9– Control	154.67 (12.47)	0.00
S.Em ±	1.87	1.19
C.D @ 5%	5.59	3.55

*Figures in the parenthesis are square root transform ($\sqrt{X+1}$) values. The figures outside the bracket are original values. (X-value of weed density)

DAT: Days After Transplanting

Table 2: Fresh and dry weight of weeds (m-2), WI and HEI at harvest as influenced by different weed management practices of onion *cv*. Bhima Shakti.

Treatments	Fresh weight of weed/m^2 (g)	Dry weight of weed/m^2 (g)	Weed index (%) [WI]	Herbicide efficiency index (%) [HEI]
T_1– Pendimethalin 30% EC @ 1.0 l/ha 3 DAT	92.67	39.63 (6.37)	23.93	6.91
T_2– Oxyfluorfen 45% EC @ 0.75 l/ha 3 DAT	86.67	38.53 (6.28)	21.18	7.55
T_3– Quizalofop ethyl 5% EC @ 0.8 l/ha at 30 DAT	82.67	32.13 (5.75)	15.91	10.07
T_4– Hand weeding at 15, 30, 45 and 60 DAT	53.00	10.20 (3.35)	0.00	-
T_5– T_1+ Hand weeding at 45 DAT	76.67	27.97 (5.38)	7.12	13.66
T_6– T_2+ Hand weeding at 45 DAT	69.67	10.33 (3.36)	0.53	40.88
T_7– T_3+Hand weeding at 60 DAT	73.33	21.30 (4.72)	10.06	17.01
T_8– Mulching with local grass/ stubbles	441.33	92.00 (9.64)	50.48	-
T_9– Control	878.33	220.67 (14.89)	65.79	-
S.Em ±	6.24	3.07	1.24	1.08
C.D @ 5%	18.70	9.21	3.73	3.23

References

1. Anonymous, National Horticulture Board, Gurgoan, 2019, 4. *http://nhb.gov.in*
2. Bhalla PL. Weed competition, crop losses and chemical weed control in onion–A Review. *Pestology.,*1978:11(2):35-39.
3. Chandrika V, Reddy DS, Sagar GK, Reddy GP. Influence of graded levels of nutrients, time of N application and weed management practices on weed dynamics, yield attributes and bulb yield of onion (*Allium cepa* L.). *Indian J. Weed Sci.*,2009:41(1-2):80-84.
4. Chopra S, Kumar A, Samnotra RK. Chemical weed management in garlic. *Indian J. Weed Sci*.,2014:46(2):146-150.
5. Islam MR, Moniruzzaman M, Obaidullah AJM, Fahim AHF. Impact of integrated weed management on bulb yield of Onion. *Bangladesh Agron. J.,*2020:23(1):83-89.
6. Kalhapure AH, Shete BT. Effect of weed management practices on weed dynamics, weed control efficiency, bulb yield and economics in onion. *J. Agric. Res. Technol*.,2013:38(2):238-240.
7. Kalhapure AH, Shete BT, Bodake PS. Integrated weed management in onion (*Allium cepa* L.). *Indian J. Agron*.,2013:58(3):408-411.
8. Kathepuri JV, Sankpal VY, Ghadage HL, Jawale SM. Weed management in irrigated onion (*Allium cepa* L.) under plane zone of western Maharashtra. *Madras Agric. J*.,2007:94(1-6):127-130.
9. Moolani MK, Sachan PL, Studies on crop weed competition–A Review. *J. of Agron.,*1966:11: 372-377.
10. Sable PA, Kurbar AR, Hugar Ashok. Effect of weed management practices on weed control and nutrient uptake in onion (*Allium cepa* L.). *Asian J. Hortic*.,2013:8(2):444-447.
11. Sharma SP, Buttar GS, Sudeep Singh, Khurana DS, Comparative efficiency at Pendimethalin and Oxyfluorfen for controlling weed in onion nursery. *Indian J. Weed Sci*.,2009:41(1-2):76-79.
12. Singh VV, Singh J, Bisen RK, Agarwal HP, Singh V, A note on weed management in onion. *Vegetable sci*.,1997:24(2):157-158.
13. Singh MP, Singh KP. Effect of crop weed competition on growth and yield of kharif onion. *Indian J. of Weed Sci.,*1994:26(3, 4):18-21.
14. Singh R, Sinha KP, Singh SP. Comparative efficacy of herbicides and hand weeding for the control of weeds in onion. *Haryana J. of Hort. Sci.,*1986:15:76-82.
15. Singh SK, Shyam R, Chaudhary S, Yadav LM. Weed management in onion. *Indian J. Weed Sci.,2016:*48(2):199-201.
16. Vijayvergiya D, Ali SA, Das MP, Ramgiry P, Uikey S. Effect of pre-emergence herbicides on weed control of kharif onion (*Allium cepa* L.) in vindhyan plateau of Madhya Pradesh. *J. Pharm. Innov*.,2018:7(1):376-378.
17. Vishnu V, Asodaria KB, Suthar A. Weed management in rabi onion (*Allium cepa* L.). *Agric. Sci. Digest.,*2015:35(2):130-133.