THE ASIAN JOURNAL OF HORTICULTURE
Volume **8** | Issue 2 | December, 2013 | 444-447

Research Paper

Article history :
Received : 19.03.2013
Revised : 01.09.2013
Accepted : 16.09.2013

Effect of weed management practices on weed control and nutrient uptake in onion (*Allium cepa* L.)

■ **P. A. SABLE, A.R. KURUBAR[1]** AND **ASHOK HUGAR[1]**

Members of the Research Forum

Associated Authors:
[1]Department of Horticulture, College of Agriculture, RAICHUR (KARNATAKA) INDIA

Author for correspondence :
P.A. SABLE
Department of Horticulture, College of Agriculture, RAICHUR (KARNATAKA) INDIA
Email : sable.pating@gmail.com

ABSTRACT : Three herbicides were evaluated for weed control in onion at Main Agriculture Research Station, Raichur Karnataka, India. The study revealed that effective weed control was under oxyfluorfen 0.26 kg a.i./ha with hand weeding (30 DAT) which was next to weed free check, followed by oxyfluorfen 0.26 kg a.i./ha + oxyfluorfen 0.26 kg a.i./ha (30 DAT) at all stages of crop growth. The same treatments showed higher weed control efficiency (97.11%) and (96.66%), respectively which were next to weed free check (100%). These two treatments also indicated lower weed index of 3.57 % and 33.48 %, respectively which were next to weed free check (0.00 %). The significantly higher weed growth at all stage of crop growth recorded in unweeded control which indicated lower weed control efficiency and higher weed index and was closely followed by treatment with one hand weeding at 30 DAT, while significantly reduced nutrient uptake by weeds 2.20 kg N, 0.50 kg P_2O_5 and K_2O 0.80 and 6.20 kg N, 0.90 kg P_2O_5 and K_2O 2.15 per hectare, respectively were recorded in treatments weed free check (T_7) and oxyfluorfen 0.26 kg a.i. per hectare with one hand weeding at 30 DAT (T_6). Whereas significantly higher nutrient uptake by plants 51.01 kg N, 9.80 kg P_2O_5, K_2O 30.70 and 1.61 kg S and 50.33 kg N, 9.30 kg P_2O_5, K_2O 29.89 and 1.10 kg S per hectare, respectively recorded in these same treatments, treatment (T_7) was at par with (T_6) regarding the plant nutrient uptake.

KEY WORDS : Herbicides, Onion, Weed control

HOW TO CITE THIS ARTICLE : Sable, P.A., Kurubar, A.R. and Hugar, Ashok (2013). Effect of weed management practices on weed control and nutrient uptake in onion (*Allium cepa* L.). *Asian J. Hort.*, **8**(2) : 444-447.

Onion is an important bulbous vegetable and spice crop of India belongs to family Alliaceae and genus *Allium*. Onion (*Allium cepa* L.) is a bulbous, biennial herb which is consumed all over the world throughout the year. It promotes appetite and useful against malaria, night blindness which also lowers blood pressure (Perane, 2001).

India is the second largest producer of onion next to China accounting for 20 per cent of the world area and 10 per cent of the world production. The area is about 5.93 lakh hectares with 75.16 lakh metric tonnes of bulb production. In India, Maharashtra, Andhra Pradesh, Assam, Bihar, Gujarat, Punjab, Karnataka and Tamilnadu, Orissa, Uttar Pradesh are major onion growing states. At present, Maharashtra is the leading state in onion production having an area of 1.21 lakh hectares with production of 14.23 lakh metric tonnes (Anonymous, 2005). Nasik district alone contributes approximately 30 per cent of production of the state and 70 per cent of total onion exported from India is from Maharashtra state. The management of weed is one of the most serious problems in onion which limits the crop yield and decreased profits. Onion is very poor competitor with weeds because of non branching habit, sparse foliage and shallow root system. Yield losses in onion due to the weeds have been reported to the extent of 10 to 70 per cents (Phogat *et al.*, 1989). *Chenopodium album* L., *Amaranthus viridis* L., *Cyperus rotundus* L., *Cynnodon dactylon* L. were the major dominant weeds observed in the crop and could be minimized by the use of herbicides as one of the method of weed control. Though hand weeding is a common practice in India, it is laborious, expensive and time consuming. A loss due to weeds mainly depends upon their intensity in the field as well as type of weed flora.

RESEARCH METHODS

Field experiment was conducted on medium black soil in New Orchard of Main Agricultural Research Station, Raichur, which is situated in the North eastern dry zone of Karnataka. The location corresponds to 16^0 12' N latitude and 77^0 20' E longitudes with an altitude of 389 meters above the mean sea level. The daily climatological data during the study period were obtained from the meteorological observatory at Main Agricultural Research Station, Raichur. The investigation was carried out during *Kharif* season of 2010. It consists three herbicides, namely butachlor, pendimethalin and oxylfuorflen and these herbicides were applied before transplanting as pre-emergent herbicides at proper moisture in the soil which is a prerequisite for spraying of herbicide. The herbicides were sprayed by use of 1000 litres of water per hectare. The quantity of water and the herbicides to be applied per plot were calculated on the area basis before spraying.

The experiment was laid out by adopting Randomized Block Design with three replications. The experimental field was brought to fine tilth by repeated ploughing and harrowing. Twenty tonnes of FYM and recommended dose of fertilizers (100:50:50 kg NPK / ha) were incorporated in the soil. The experimental plots of size 3 x 2.6m and the seedlings of variety Nasik Red were transplanted from nursery on September 25th, 2010 by keeping a distance of 15 cm from row to row and 10 cm from plant to plant. Plant protection practices were undertaken as per the package of practice.

The observations were recorded on weed count, weed control efficiency and weed index. The weed count in the net plot was calculated by quantitative method for this purpose two quadrants each having area of $0.25m^2$ were randomly prepared and the total weeds per $0.25m^2$ area were counted and recorded at 30, 60 and 90 DAT. Weed control efficiency (WCE) of each treatment was calculated by the following formula.

$$\text{Weeds control efficiency (\%)} = \frac{\text{Weed dry weight in unweeded control} - \text{Weed dry weight in treatment}}{\text{Weed dry weight in unweeded control}} \times 100$$

Weed index was calculated by using the following formula.

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

where,

X = Yield from the weed free plot and Y = Yield from the treated plot.

The observations were recorded at the time of harvesting of crop by plant as well as weed nutrient analysis with a view to know the uptake of nitrogen, phosphorus, potash and sulphur by the plant as well as weed from different weed management treatments, the composite plant sample and weed sample at harvest from different treatments was estimated by modified micro-kjeldhal method, vanadomolybdate yellow colour method and flame photometer method.

$$\text{Uptake (kg/ha)} = \frac{\text{Nutrient concentration (\%) x Bioass (kg/ha)}}{100}$$

The collected data regarding experimental observations were subjected for statistical analysis.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Weed control efficiency (%) and weed index (%) :

The treatment oxyfluorflen 0.26 kg a.i. per hectare + hand weeding at 30 DAT (T_6) followed by oxyflurofen 0.26 kg a.i. per hectare + oxyfluorfen 0.26 kg a.i. per hectare at 30 DAT (T_5) significantly recorded more weed control efficiency (97.11 and 96.66%, respectively) than one hand weeding (T_9) and unweeded control (T_8) which recorded 51.09 and 00.00 per cent, respectively (Table 1). The same treatments (T_6 and T_5) on contrary, possessed lesser weed indices (3.57 and 33.48 %, respectively) than one hand weeding and unweeded control (78.84 and 79.90 %, respectively). The higher weed control efficiency (100 %) and lower weed index (00.00 %) were observed in weed free check. The higher weed control efficiency and lower weed index under those herbicide treatments than hand weeding treatment might be due to higher efficiency of herbicides by way of their physiological actions, namely oxyfluorfen which uncouple oxidative phosphorylation and prevent ATP production during respiration. The physiological action of butachlor may be due to inhibition of cell division and other physiological functions (Walia, 2006).

Weed flora:

In the present investigation, the major monocot weeds like *Cyprus rotundus* L., *Cynedon dactylon* L. *Echinocloa crusgalli* L. *Brachiaria mutica* L. and dicot weeds like *Euphorbia hirta* L., *Enuphorbia geniculata* L., *Acharanthus aspera* L., *Phyllanthus niruri* L., *Tridex procumbence* L., *Parthenium hesterophorus* L., *Commelina bengalensis* L., were recorded.

Weed count (per 0.25 m^2) :

All the weed control treatments had significantly lower weed population than unweeded control at different stage of crop growth. At 30, 60 and 90 DAT, the treatment T_6 (oxyfluorfen 0.26 kg a.i. per hectare + hand weeding at 30 DAT) followed by T_5 (oxyfluorfen 0.26 kg a.i. per hectare + oxyfluorfen 0.26 kg a.i. per hectare at 30 DAT) significantly

recorded lesser weed population than other treatments except weed free check (Table 2 and Fig. 1). The unweeded control (T8) significantly recorded higher number of weeds (80.00/ 0.25 m^2, 119.00/0.25m^2 and 127.00/0.25m^2 at 30, 60 and 90 DAT, respectively) than weed free check (00.00/0.25 m^2) at all the stages of crop growth. The lesser weeds in herbicides treatments might be due to non germination of weed seeds caused by herbicidal action. The higher weed population under unweeded control (T_8) was due to no disturbance to the weed growth either by herbicides or cultural practices. Bhalla (1978) reported similar effect on weed growth. The treatments with butachlor recorded higher weed count which might be due to lesser efficiency of butachlor to suppress the weeds for longer period as ascertained by presence of new flushes of weeds at later stages. On contrary, lesser weed count under oxyfluorfen treatments was because of longer persistence of chemical on weeds which might have helped in total suppression of weeds (Bhalla, 1978). The lesser weed count in the oxyfluorfen as herbicide with combination of one hand weeding at 30 DAT (T_6) might be due to suppression of almost a weed by the action of oxyfluorfen as pre-emergent herbicides and removal of remaining weeds, if any by hand weeding.

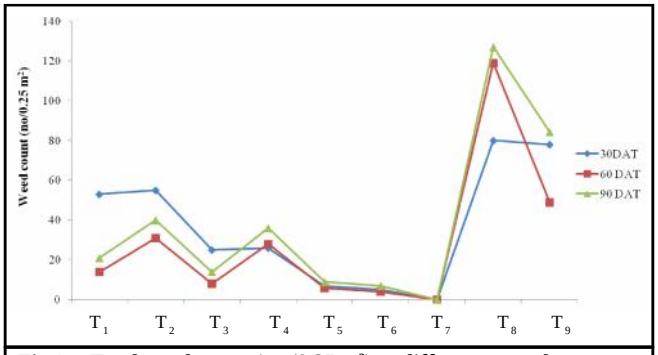

Fig 1 : Total weed count (no./0.25 m^2) at different growth stages as influenced by weed control treatments

Nutrient uptake by weeds as well as onion crop :

There was inverse relationship between the nutrient

Table 1 : Effect of weed management practices on weed index (%) and weed control efficiency (%)

Tr. No.	Treatments	WI	WCE
T_1	Butachlor 1 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i/ha (30 DAT)	65.90	83.36
T_2	Butachlor 1 kg a.i/ha (PE) + hand weeding (30 DAT)	69.18	79.74
T_3	Pendimethalin 1 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i./ha (30 DAT)	52.20	90.24
T_4	Pendimethalin 1 kg a.i./ha (PE) + hand weeding (30 DAT)	67.35	81.37
T_5	Oxyfluorfen 0.26 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i./ha (30 DAT)	33.48	96.66
T_6	Oxyfluorfen 0.26 kg a.i./ha (PE) + hand weeding (30 DAT)	3.57	97.11
T_7	Weed free check	0.00	100
T_8	Unweeded control	79.90	00
T_9	One hand weeding (30 DAT)	78.84	51.09

*PE- pre-emergence, *DAT-Days after transplanting
*WI- Weed index, *Weed control efficiency

Table 2 : Effect of weed management practices on weeds count (no./0.25 m^2)

Tr. No.	Treatments	Weed count 30 DAT	Weed count 60 DAT	Weed count 90DAT
T_1	Butachlor 1 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i/ha (30 DAT)	53 (7.31)	14 (3.81)	21(4.64)
T_2	Butachlor 1 kg a.i/ha (PE) + hand weeding (30 DAT)	55 (7.45)	31 (5.61)	40(6.36)
T_3	Pendimethalin 1 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i./ha (30 DAT)	25 (5.05)	08 (2.92)	14(3.81)
T_4	Pendimethalin 1 kg a.i./ha (PE) + hand weeding (30 DAT)	26 (5.15)	28 (5.34)	36(6.04)
T_5	Oxyfluorfen 0.26 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i./ha (30 DAT)	07 (2.74)	06 (2.55)	09(3.08)
T_6	Oxyfluorfen 0.26 kg a.i./ha (PE) + hand weeding (30 DAT)	05 (2.35)	04 (2.12)	07(2.74)
T_7	Weed free check	00 (0.71)	00 (0.71)	00(0.71)
T_8	Unweeded control	80 (8.97)	119 (10.93)	127(11.29)
T_9	One hand weeding (30 DAT)	78 (8.75)	49.0 (7.04)	84.32(9.21)
	S.E.±	0.71	0.38	0.38
	C.D. (P=0.05)	2.14	1.15	1.15
	CV	23.91	14.62	12.53

*Figures in parentheses indicate square root transformed values ? X+0.5
*DAT-Days after transplanting, * HW-Hand weeding
*PE- pre-emergence

Table 3 : Effect of weed management practices on nutrient uptake by weed and plant (kg/ha)

Tr. No.	Treatments	Uptake by weed			Uptake by plant			
		N	P_2O_5	K_2O	N	P_2O_5	K_2O	S
T_1	Butachlor 1 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i/ha(30 DAT)	17.70	1.20	5.72	40.21	8.10	22.77	0.63
T_2	Butachlor 1 kg a.i/ha (PE) + hand weeding (30 DAT)	21.50	1.84	7.33	44.10	5.13	15.20	0.45
T_3	Pendimethalin 1 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i./ha (30DAT)	16.55	1.10	4.30	47.22	8.60	23.05	0.85
T_4	Pendimethalin 1 kg a.i./ha (PE) + hand weeding(30 DAT)	20.33	1.80	6.50	46.30	6.32	16.03	0.58
T_5	Oxyfluorfen 0.26 kg a.i./ha (PE) + oxyfluorfen 0.26 kg a.i./ha (30 DAT)	7.10	1.10	2.70	48.30	7.13	27.05	1.08
T_6	Oxyfluorfen 0.26 kg a.i./ha (PE) + hand weeding (30 DAT)	6.20	0.90	2.15	50.33	9.30	29.89	1.10
T_7	Weed free check	2.20	0.50	0.80	51.01	9.80	30.70	1.61
T_8	Unweeded control	43.40	5.10	13.50	6.70	1.80	3.30	0.30
T_9	One hand weeding (30 DAT)	41.39	4.80	12.41	7.20	2.10	3.70	0.41
	S.E.±	1.92	0.19	0.38	1.15	0.38	0.77	0.04
	C.D. (P=0.05)	5.77	0.58	1.15	3.46	1.15	2.31	0.12
	CV	17.01	16.35	10.23	5.26	10.31	6.98	8.55

uptake by crop and weeds. Crop under treatment unweeded control (T_8) removed significantly lower N, P, K and S while uptake by weed was maximum (Table 3). In general, the nutrients removed by weeds in unweeded control treatment increased due to increased weed population and weed growth. The maximum removal of 43.40 kg N, 5.10 kg P_2O_5 and K_2O 13.50 per hectare by weeds was noticed in unweeded control (T_8). Treatments weed free check (T_7) and oxyfluorfen 0.26 kg a.i. per hectare with one hand weeding at 30 DAT (T_6) recorded significantly reduced uptake of nutrients by weeds *i.e.*2.20 kg N, 0.50 kg P_2O_5 and K_2O 0.80 and 6.20 kg N, 0.90 kg P_2O_5 and K_2O 2.15 per hectare, respectively followed by treatment oxyfluorfen 0.26 kg a.i. per hectare with oxyfluorfen 0.26 kg a.i. per hectare at 30 DAT (T_5). This might have been due to decreased weed population and weed dry weight of weeds when compared to other treatments. This result is in confirmation with the findings of Nandal and Singh (2002). Whereas the weed free check (T_7) recorded significantly higher nutrient uptake by onion plants *i.e.*51.01 kg N, 9.80 kg P_2O_5, K_2O 30.70 and 1.61 kg S per hectare, respectively which was at par with oxyfluorfen 0.26 kg a.i. per hectare with one hand weeding at 30 DAT (T_6) *i.e.* 50.33 kg N, 9.30 kg P_2O_5, K_2O 29.89 and 1.10 kg S per hectare. The significantly reduced nutrients uptake by onion plants were recorded in treatment unweeded control (T_8) *i.e.* 6.70 kg N, 1.80 kg P_2O_5, K_2O 3.30 and 0.30 kg S per hectare which was at par with treatment one hand weeding at 30 DAT (T_9)) *i.e.* 7.20 kg N, 2.10 kg P_2O_5, K_2O 3.70 and 0.41 kg S per hectare. This is might have been due to increased weed population and weed dry weight of weeds when compared to other treatments. This result also is in confirmation with the findings of Nandal and Singh (2002).

REFERENCES

Anonymous (2005). National Horticulture Board Database 2005. NHB Gurgaon (Haryana) pp. 212-214.

Bhalla, P.L. (1978). Weed competition, crop losses and chemical and weed control in *Allium cepa* L. A review, *Pestol.*, **11**(11): 35-39.

Nandal, T.R. and Singh, Ravinder (2002). Integrated weed management in onion under Himachal Pradesh conditions. *Indian J. Weed Sci*, **34**(1-2): 72-75.

Perane, R.R. (2001). Studies on purple blotch of onion caused by *Alternariya cepuleculi* Rao with special reference to toxin production Ph.D. Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (M.S.) INDIA.

Phogat, B.S., Bhan, V.M. and Singh, Jode (1989). Efficacy of herbicides on weeds in *Kharif* onion. *Indian J. Weed. Sci.*, **21** (1&2) : 78-79.

Walia, U.S. (2006). *Weed management*. Kalayani Publishers. pp. 158-195.