



## Integrated weed management in onion

A.H. Kalhapure\* and B.T. Shete

Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra 413 722

Received: 29 February 2012; Revised: 9 June 2012

### ABSTRACT

A field experiment was carried out for two consecutive years during *Kharif* seasons of 2010 and 2011 to find out practically convenient and economically feasible weed management practice in onion at breeder seed production farm in Mahatma Phule Krishi Vidyapeeth, Rahuri. Different combinations of hand weeding with application of Pendimethalin 1.0 kg/ha (pre-planting) and oxyfluorfen 0.250 kg/ha (post-emergence) were used in onion variety 'Baswant-780'. Weed free check treatment (three hand weeding at 20, 40 and 60 DAS) recorded significantly lowest weed density, dry weight of weed and higher weed control efficiency. All the growth attributes of onion *viz.*, plant height, neck thickness, bulb weight and bulb diameter were recorded maximum in weed free. This treatment also recorded highest bulb yield and gross monetary return per hectare, however maximum B:C ratio was observed in treatment pendimethalin 1.0 kg/ha (PP)+ Oxyfluorfen 0.250 kg/ha (POE)+ One hand weeding at 40 DAS.

**Key words:** Integrated weed management, Oxyfluorfen, Pendimethalin, Soybean

Onion (*Allium cepa* L.) is one of the most important commercial vegetable crops grown all over the world. In India onion occupies about 1.06 million hectare area having 15.12 million metric tons of production and average productivity of 14.2 tons per hectare (Anonymous 2011). The most important onion growing states are Maharashtra, Tamil Nadu, Andhra Pradesh, Bihar and Punjab. Onion is slow growing, shallow rooted crop with narrow, upright leaves and non branching habit. Due to this type of growing habit, onion crop cannot compete well with weeds. In addition to this, frequent irrigation water and fertilizer application allows for successive flushes of weeds in onion. Yield loss due to weed infestation in onion has been recorded to the tune of 40 to 80% (Channapagoudar and Biradar 2007). The conventional methods of weed control (hoeing and weeding) are laborious, expensive and insufficient. On the other hand, use of herbicides alone does not prove effective for weed control because of their selectivity. Hence an attempt was made to find out the appropriate combination of cultural and chemical weed management practices for weed control in onion which is practically effective and economically feasible for farmers.

### MATERIALS AND METHODS

An experiment was conducted during *Kharif* season of 2010 and 2011 at Breeder Seed Production Farm, Seed Cell Unit, MPKV, Rahuri. The soil of experimental field was medium black with slightly saline nature. The experiment was laid out in randomized block design with three

replications and nine treatments, *viz.*, weed free check (3 hand weeding at 20, 40 and 60 DAS), one hand weeding at 20 DAS, pendimethalin 1.0 kg/ha (PP), oxyfluorfen 0.250 kg/ha (POE), pendimethalin 1.0 kg/ha (PP)+ one hand weeding at 40 DAS, oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS, pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE), pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS, weedy check. Two months old seedlings of onion variety 'Baswant-780', were transplanted in the month of August during 2010 and 2011 at a spacing of 45x10 cm on ridges and furrows type of layout. Pendimethalin was applied before one week of transplanting as pre-planting while oxyfluorfen was applied at 25 days after transplanting when weeds were at 3-4 leaf stage.

### RESULTS AND DISCUSSION

#### Effect on weeds

The prominent weed species in the experimental plot were: *Chenopodium album*, *Portulaca oleracea*, *Euphorbia* spp., *Cynodon dactylon*, *Parthenium hysterophorous*, *Cyperus rotundas* and *Amaranthus viridis*. All treatments caused significant reduction in total weed density and dry weight of weeds as compared to unweeded control during both the years (Table 1). Significantly lower weed density was observed in weed free check (three hand weeding at 20, 40 and 60 DAS), however it was at par with treatment pendimethalin 1.0 kg/ha (PP) + oxyfluorfen 0.250 kg/ha (POE) + one hand weeding at 40 DAS. Also treatment oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40

\*Corresponding author: aniket079@yahoo.co.in

**Table 1. Effect of integrated weed management on various weed parameters in onion**

Treatment	Weed density (no./m <sup>2</sup> )			Dry weight of weeds (g/m <sup>2</sup> )			Weed control efficiency (%)		
	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled
Weed free check	35.9	34.0	37.7	36.9	34.7	32.5	71.7	70.66	72.8
One hand wedding	72.3	72.9	71.6	78.3	76.1	73.9	50.5	53.12	48.0
Pendimethalin 1.0 kg/ha	80.2	80.0	80.5	78.6	76.4	74.2	45.9	52.13	39.8
Oxyfluorfen 0.250 kg/ha	80.0	81.7	78.3	74.4	72.3	70.1	52.3	51.77	52.8
Pendimethalin 1.0 kg/ha + one hand weeding	59.5	61.2	57.7	60.4	58.2	56.0	62.2	60.56	63.8
Oxyfluorfen 0.250 kg/ha + one hand weeding	53.1	54.7	51.4	56.6	54.4	52.2	60.7	61.89	59.4
Pendimethalin 1.0 kg/ha + oxyfluorfen 0.250 kg/ha	59.3	58.2	60.4	63.3	61.1	58.9	61.1	60.21	62.1
Pendimethalin 1.0 kg/ha + oxyfluorfen 0.250 kg/ha + one hand wedding	40.9	42.5	39.3	43.3	41.1	39.0	70.6	70.23	70.9
Weedy check	162.5	172.2	152.7	142.9	134.8	126.7	0	0	0
LSD (P= 0.05)	10.7	11.4	10.2	13.3	12.4	11.5	-	-	-

**Table 2. Effect of integrated weed management practices on various growth attributes of onion**

Treatment	Plant height (cm)		Neck thickness (cm)		Bulb weight (g)		Bulb diameter (cm)		Dry matter (g/plant)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Weed free check	50.5	49.5	1.36	1.33	75.7	72.8	6.43	5.97	22.5	21.4
One hand wedding	30.8	30.1	1.22	1.19	43.6	41.7	3.22	3.44	12.9	11.6
Pendimethalin 1.0 kg/ha	27.7	27.2	1.17	1.18	38.8	38.5	3.78	3.32	11.4	10.7
Oxyfluorfen 0.250 kg/ha	26.1	25.3	1.15	1.17	39.8	37.9	3.51	3.19	11.7	10.7
Pendimethalin 1.0 kg/ha + one hand weeding	68.6	34.0	1.21	1.25	56.8	54.4	4.61	3.44	16.8	15.5
Oxyfluorfen 0.250 kg/ha + one hand weeding	34.1	33.6	1.26	1.22	61.2	59.2	4.67	3.91	18.3	17.5
Pendimethalin 1.0 kg/ha + oxyfluorfen 0.250 kg/ha	28.6	28.2	1.24	1.29	45.6	43.7	4.19	3.58	13.5	12.6
Pendimethalin 1.0 kg/ha + oxyfluorfen 0.250 kg/ha + one hand wedding	45.3	44.5	1.24	1.34	69.3	67.0	5.13	5.24	20.7	20.6
Weedy check	20.9	20.4	1.17	1.15	28.4	27.2	2.22	2.27	8.4	7.8
LSD (P= 0.05)	4.5	4.3	0.11	0.15	3.1	3.1	0.18	0.24	1.3	1.5

DAS, treatment pendimethalin 1.0 kg/ha (PP)+ one hand weeding at 40 DAS and treatment pendimethalin 1.0 kg/ha (PP) were on par with each other. Highest weed density and dry weight were recorded in weedy check. Highest weed control efficiency was observed in weed free check

followed by pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand wedding at 20 DAS. Similar observations were also made by Kolhe (2001) and Warade *et al.* (2006).

**Table 3. Effect of integrated weed management practices on yield and economics of onion**

Treatment	Bulb yield (t/ha)			Gross monetary return (₹/ha)			B : C ratio		
	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled
Weed free check	26.93	25.24	26.09	1,88,510	1,76,680	1,82,595	2.53	2.37	2.45
One hand weeding	19.52	18.59	19.06	1,36,640	1,30,130	1,33,385	2.29	2.18	2.24
Pendimethalin 1.0 kg/ha	15.77	14.56	15.17	1,10,390	1,01,920	1,06,155	2.04	1.88	1.96
Oxyfluorfen 0.250 kg/ha	16.44	15.53	15.99	1,15,080	1,08,710	1,11,895	2.13	2.01	2.07
Pendimethalin 1.0 kg/ha + one hand weeding	21.14	20.39	20.77	1,47,980	1,42,730	1,45,355	2.40	2.32	2.36
Oxyfluorfen 0.250 kg/ha + one hand weeding	21.24	20.80	21.02	1,48,680	1,45,600	1,47,140	2.49	2.44	2.47
Pendimethalin 1.0 kg/ha + oxyfluorfen 0.250 kg/ha	19.63	18.45	19.04	1,37,410	1,29,150	1,33,280	2.45	2.30	2.38
Pendimethalin 1.0 kg/ha + oxyfluorfen 0.250 kg/ha + one hand weeding	24.12	23.30	23.71	1,68,840	1,63,100	1,65,970	2.81	2.71	2.76
Weedy check	9.48	8.74	9.11	66,360	61,180	63,770	1.27	1.17	1.22
LSD (P= 0.05)	2.18	2.25	2.22	2,559	1,935	2,247	-	-	-

**Effect on crop growth**

All the weed management treatments were significantly superior over control in respect of all growth attributes during both the years (Table 2). Significantly taller plants were observed in weed free check followed by pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 20 DAS whereas lowest plant height was observed in treatment Weedy check.

The pooled data of the two experimental years revealed significantly higher neck thickness in weed free check over the control, however, treatments *viz.*, weed free check, pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS, oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS, pendimethalin 1.0 kg/ha (PP)+ one hand weeding at 40 DAS and pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE) were at par with each other. Significantly higher bulb weight and bulb diameter were observed in weed free check (three hand weeding at 20, 40 and 60 DAS) over rest of the treatments, whereas weedy check recorded lowest and pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS were at the second place for these growth attributes.

In respect of dry matter per plant, weed free check recorded significantly higher weight over rest of the treatments, it was on par with pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 20 DAS. Khalid Mahmood *et al.* (2006) and Chandrika *et al.* (2009) also reported similar results from their studies.

**Effect on yield**

Significantly higher bulb yield per hectare and net monetary return per hectare were observed in weed free check over rest of the treatments (Table 3) followed by pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS whereas treatment weedy check produced lowest bulb yield per hectare. The treatments oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS, pendimethalin 1.0 kg/ha (PP)+ one hand weeding at 40 DAS, pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE) and one hand weeding at 20 DAS were on par with each other. These result in respect of yield attributes were in close conformity with the earlier findings of Sukhadia *et al.* (2002) and Chopra and Chopra (2007).

**Economics**

The benefit: cost ratio was maximum for pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS and this index was varied in the range of 1.22 to 2.76, when weeds in onion were controlled either by herbicides or by hand weeding (Table 3). Though weed free check (three hand weeding at 20, 40 and 60 DAS) fetched the higher gross monetary return (₹ 182595/-) over all the other treatments, it had benefit: cost ratio (2.45) lesser than treatment pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS (2.76). It showed that treatment pendimethalin 1.0 kg/ha (PP)+ oxyfluorfen 0.250 kg/ha (POE)+ one hand weeding at 40 DAS was

practically convenient and economically feasible for control of weeds in onion. Similar results were reported by Nandal and Singh (2002) and Patel *et al.* (2011)

### REFERENCES

- Anonymous. 2011. <http://www.faostat.fao.org>
- Chandrika VD, Reddy Srinivasulu, Sagar KG and Reddy G. Prabhakara. 2009. 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 Journal of Weed Science* **41**(1&2): 80–89.
- Channapagoudar BB and Biradar NR. 2007. Physiological studies on weed control efficiency in direct sown onion. *Karnataka Journal of Agricultural Science* **20**(2): 375- 376.
- Chopra Nssha and Chopra NK. 2007. Production of weed free mother bulb of onion (*Allium cepa*) through integration of herbicides and weeding. *Indian Journal of Agronomy* **52**(1): 80–82.
- Khokhar Khalid Mahmood, Mahmood Tariq, Choudhary Muhammad Shakeet, M. Farooq. 2006. Evaluation of integrated weed management practices for onion in Pakistan. *Crop Protection* **25**: 968–972.
- Kolhe SS. 2001. Integrated weed management in onion (*Allium cepa* L.). *Indian Journal of Weed Science* **33**(1&2): 26–29.
- Nandal TR and Ravinder Singh. 2002. Integrated weed management in onion (*Allium cepa* L.) under Himachal Pradesh conditions. *Indian Journal of Weed Science* **34**(1&2): 72–75.
- Patel TU, Patel CL, Patel DD, Thanki JD, Patel PS and Jat Ram A. 2011. Effect of weed and fertilizer management on weed control and productivity of onion (*Allium cepa*). *Indian Journal of Agronomy* **56**(3): 267–272.
- Sukhadia NM, Ramani BB and Dudhantra MG. 2002. Response of onion (*Allium cepa* L.) to methods of sowing and weed management practices. *Indian Journal of Weed Science* **34**(1&2): 76–79.
- Warade AD, Gonge VS, Jogdande ND, Ingole PG and Karunakar AP. 2006. Integrated weed management in onion. *Indian Journal of Weed Science* **38**(1&2): 92–95.