

Efficacy of different herbicides against weed flora in Onion (*Allium cepa*. Lindeman)

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ABSTRACT

Field experiments were carried out at Vegetable Research Farm, JNKVV, Jabalpur during three consecutive years 2009-12 to find out the efficacy of different herbicides in onion crop. The dominant weed flora recorded over *Chenopodium album*, *Melilotus albus*, *Eragrostis cillansis*, *Parthenium hysterophorus*, *Anagallis arvensis* L., *Cyperus rotundus* and *Spergula arvensis*. Among the various treatments, the application of Oxyfluorfen 23.5% EC before planting + Quizalofop ethyl 5% EC at 30 days after transplanting recorded highest weed control efficiency and higher marketable bulb yield with cost benefit ratio.

Key words: Onion weed, weed flora, weedicides

Onion is one of the most important vegetable crops in India for thousand of year. It is mainly used for cuisine and culinary purpose, it also relished in from with meals as salad. Onion is earning valuable foreign exchange for the country (Ray *et. al.* 1980). Onion is the second only to tomato in their importance as a vegetable in the tropics. Onion (*Allium cepa* L.) belonging to family Alliaceae. India is next to China in area and production of onion. Among the different states Maharashtra is leading state in terms of area (26.74%) and production (28.44%) with an average yield of 13.94 tonnes ha⁻¹. Other major onion growing states are Gujarat, Karnataka, Orissa, Uttar Pradesh, Andhra Pradesh, Tamil Nadu and Rajasthan. The yield level of onion is very poor in the state of Madhya Pradesh. The reason for low productivity could be ascribed to a number of factors which can be related to production. Due to frequent irrigation, providing congenial condition for weed growth. Weed problem in onion is very serious. High reduction in bulb yield of onion was observed due to weeds infection. Hand weeding is a common method of weed control adopted by farmers but comparatively this method is costly and time consuming. This problem assumes added significance due to non-availability of adequate labours during peak period of operation. Whereas, post-emergence herbicides kill weeds and keep the hardy weeds under control by arresting their growth through various kinds of deformities in foliage and growing point.

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MATERIALS AND METHODS

The experiment was conducted at Vegetable Research Farm, Maharajpur, Department of Horticulture, JNKVV, Jabalpur (M.P.) during the Rabi season 2009-10, 2010-11 and 2011-13 to find out the efficacy of different herbicides with eight treatments viz., Oxyfluorfen (23.5% EC before Planting + Quizalofop ethyl 5% EC at 30 DAT, Combined spray of Oxyfluorfen 23.5% EC and Quizalofop Ethyl 5% EC at the time of transplanting and at 30 DAT, Pendimethalin 30% EC application before planting and Second at 30 DAT, Pendimethalin 30% EC application before planting + Quizalofop Ethyl 5% EC at 30 DAT, Combined spray of Pendimethalin 30% EC + Quizalofop Ethyl 5% EC at the time of planting and second at 30 DAT, DOGR recommended practices (Oxyfluorfen 23.5% EC before transplanting + one hand weeding at 40-60 DAT and Weedy check. Onion cv. Agrifound light red was sown in nursery on last week of October and first week of November during all experimental years. The trails were laid out in randomized block design with three replications, each in 3x2m plots keeping 15 cm row to row and 10 cm plant to plant distance. The data were recorded as per standard procedure, weed parameters (weed population, fresh and dry weight of weeds, weed control efficiency and weed index) studies on crop (plant height, number of leaves and bolting percentage) and yield parameters (average weight of bulb, bulb diameters {including "A" = >55 mm, "B" = 45-55 mm and "C" = <45 mm diameter, grade in percentage}, double percentage, total bulb yield,

marketable yield and phyto-toxicity symptoms in onion leaves. Observation of the characters under study of onion plants was recorded from the ten randomly selected plants from each plots.

RESULTS AND DISCUSSION

Weed population

The dominant weed flora found in onion crop were *Chenopodium album*, *Melilotus albus*, *Eragrostis cillansis*,

Parthenium hysterophorus, *Anagallis arvensis* L., *Cyperus rotundus* and *Sperogul aarvensis*.

At 45 and 60 days after transplanting (DAT), the most dominant (qualify) weed *Cyperusrotundus* followed by *Anagallis arvensis* L., *Melilotus alba*, *Eragrostis cillansis*, *Sperogul aarvensis* and *Chenopodium album*, were recorded. Highest weed population indicated that weed crop competition and stress on onion crop. Similar finding have been reported by Wilson and Scheffer (1981).

Table 1: Morphological and yield attributing characters under various herbicidal treatments in onion

Treatment	PH(cm)	NOL	ABW(g)	Grade of bulb(%)			TY(qha ⁻¹)	MY(qha ⁻¹)
				A	B	C		
T ₁	56.15	9.78	50.93	35.03	47.12	17.84	253.80	233.40
T ₂	56.28	9.35	57.87	43.97	29.88	26.15	304.27	287.21
T ₃	55.63	9.31	41.50	35.18	42.33	22.49	279.22	257.81
T ₄	55.69	10.00	49.23	34.16	44.86	21.78	262.01	246.92
T ₅	57.25	9.67	42.12	39.38	43.23	17.39	276.52	263.88
T ₆	55.77	10.97	47.57	34.57	41.12	24.31	295.27	281.83
T ₇	57.91	9.80	48.67	37.30	41.57	21.13	267.76	249.05
T ₈	55.26	8.98	47.23	34.65	36.78	28.57	236.52	218.76
Mean	56.24	9.73	48.14	36.78	40.86	22.46	271.92	254.86
LSD (0.05)	3.09	1.55	13.74	9.44	8.15	8.14	34.09	33.74
CV (%)	3.82	9.09	16.34	14.69	11.41	20.75	7.17	7.58

Application of Oxyfluorfen 0.17 kg ha⁻¹ before transplanting and at 30 DAT, application of Oxyfluorfen 0.08 kg ha⁻¹ before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT and combined spray of Oxyfluorfen 0.08 kg ha⁻¹ + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at the time of transplanting and 30 DAT are the most effective selective herbicides for controlling *Chenopodium*

album, *Melilotus albus*, *Eragrostis cillansis*, *Parthenium hysterophorus*, *Anagallis arvensis* L., *Cyperus rotundas* and *Sperogula arvensis* on the basis of weed density and relative density. It could be possible due to better weed control efficiency of these herbicides. The monocot weeds namely *Cyperus rotundas* L. could not be controlled completely by any of the herbicides.

Table 2: Efficacy of different herbicides on weed flora of onion

Treatment	McPm ⁻²	DcPm ⁻²	McFW(g)	DcFW(g)	McDW(g)	DcDW(g)	WCE(%)
T ₁	22.33	15.33	42.26	38.54	11.46	10.58	89.86
T ₂	19.33	24.67	30.87	68.58	9.08	18.86	88.37
T ₃	24.67	18.67	49.01	64.41	13.39	17.57	87.64
T ₄	20.00	23.67	40.06	72.70	11.21	23.64	85.41
T ₅	23.00	28.33	42.54	75.29	12.53	20.17	82.65
T ₆	31.00	29.67	54.06	70.17	14.58	19.35	82.10
T ₇	18.00	29.00	29.42	75.35	8.24	22.05	85.83
T ₈	43.00	53.33	79.43	142.5	22.29	43.09	-
Mean	25.17	27.83	45.95	75.94	12.85	21.92	86.72
LSD (0.05)	11.15	7.48	14.02	9.98	3.95	4.87	4.29
CV (%)	25.35	15.38	17.46	7.52	17.59	12.71	2.83

Weed biomass

The weed biomass accumulated by weed is the real index which determines the efficiency of herbicides to control the weeds and these are summarized in table 2. Minimum weed biomass was noted in T₈ manual weeding (two hand weeding 15 & 30 DAT) (6.03 g⁻²) followed by plot spray with Oxyfluorfen 0.17 kg ha⁻¹ before transplanting and at 30 DAT (7.15 g⁻²), T₂ plot spray with Oxyfluorfen 0.08 kg ha before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT (8.68 g⁻²), T₃ where plot treated with combined spray of Oxyfluorfen 0.08 kg ha⁻¹ + Quizalofop-p-ethyl 0.03 kg ha at the time of transplanting and at 30 DAT (9.17 g⁻²) and T₇ application of Oxyfluorfen 0.17 kg ha⁻¹ before transplanting + one hand weeding at 40 DAT (9024 g⁻²). However, the maximum (102.80 g⁻²) weed biomass was observed in T₉ weedy check.

Weed control efficiency

The weed control efficiency was worked out in different treatments and is given in table. It is evident from the table 2 that the maximum (91.43%) weed control efficiency was observed in treatment T₈ manual weeding (two hand weeding 15 and 30 DAT) followed by (90.43%) in T₁ Oxyfluorfen 0.17 kg ha⁻¹ before transplanting and at 30 DAT, T₂ application of Oxyfluorfen 0.08 kg ha⁻¹ before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT (88.78%) and T₃ combined spray of Oxyfluorfen 0.08 kg ha⁻¹ + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at the time of transplanting and at 30 DAT (86.98%). However, the minimum (82.24%) weed control efficiency was exhibited in T₆ where two combined spray of Pendimethalin + Quizalofop-p-ethyl (0.30 kg ha⁻¹) at the time of transplanting and at 30 DAT. These findings are in confirmation with finding Mondal *et al.*

(2005), Bhutia *et al.* (2005), Kumar and Mourya (2006) and Dalayai *et al.* (2008b).

Morphological parameters

The maximum plant height was recorded with the application of Oxyfluorfen 0.17 kg ha⁻¹ before transplanting and at 30 DAT, application of Oxyfluorfen 0.08 kg ha⁻¹ before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ and at 30 DAT and combined spray of Oxyfluorfen 0.08 kg ha⁻¹ + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at the time of transplanting and at 30 DAT. Similar finding were also reported by Kachare *et al.* (2005), Kumar and Mourya (2006), Ghadage *et al.* (2006), Murthy *et al.* (2007) and Dalayai *et al.* (2008). The maximum number of leaves were recorded with the application of Oxyfluorfen 0.17 kg ha⁻¹ before transplanting and at 30 DAT followed by application of Pendimethalin (0.60 kg ha⁻¹) before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT. Highest average weight of 10 bulb was recorded with the application of Oxyfluorfen 0.08 kg ha⁻¹ before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT followed by Oxyfluorfen 0.17 kg ha⁻¹ before transplanting at 30 DAT, spray of Pendimethalin (0.60 kg ha⁻¹) before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT. The findings are in close proximation to that the Kachare *et al.* (2005), Nargis *et al.* (2006). Kumar and Mourya (2006) and Sharma and Khandwe (2008).

Yield parameters

Maximum "A" grade bulb was noted with the application of Oxyfluorfen 0.17 kg ha⁻¹ before transplanting and at 30 DAT and "B" grade bulb was recorded in combined spray of Pendimethalin (0.30 kg ha⁻¹) + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT, while, "C" grade bulb was found maximum in combined spray of Oxyfluorfen 0.08 kg ha⁻¹ +

Table 3: Economics of different herbicides in onion

Treatment	Marketable bulb yield (t ha ⁻¹)	Gross income (Rs ha ⁻¹)	Expenditure (Rs ha ⁻¹)	Net income (Rs ha ⁻¹)	B:C ratio
T ₁	24.47	122350	67040	55310	1:1.82
T ₂	31.07	155350	67510	87840	1:2.30
T ₃	24.77	123850	71020	52830	1:1.74
T ₄	25.30	126500	66800	59700	1:1.89
T ₅	26.80	134000	68025	65975	1:1.96
T ₆	29.50	147500	72050	75450	1:2.04
T ₇	26.40	132000	75020	56980	1:1.75
T ₈	5.40	27000	63000	-36000	1:0.42

Market price of onion @ Rs 5/- per kg

Quizalofop-p-ethyl 0.03 kg ha⁻¹ at the time of transplanting and at 30 DAT. These findings are in agreement with the finding of Kachare *et al.* (2004), Ghadage *et al.* (2006), Jilani *et al.* (2007) and Hussain *et al.* (2008).

Application of Oxyfluorfen 0.08 kg ha⁻¹ before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT was exhibited maximum marketable, total bulb yield and also in weed competition index followed by combined spray of Pendimethalin (0.30 kg ha⁻¹) + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at the time of transplanting and at 30 DAT. The findings are in close proximity to that the Nargiset *et al.* (2006). Jilani *et al.* (2007), Murthy *et al.* (2007) and Hussain *et al.* (2008). Warade *et al.* (2008) and Dalayai *et al.* (2008c).

Minimum toxic effect of herbicides on leaves was observed with the application of Pendimethalin (0.60 kg ha⁻¹) before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT, while the it was maximum observed with the Oxyfluorfen 0.17 kg ha⁻¹ before transplanting and at 30 DAT. Similar result have reported by Channappagoudar and Biradar (2007) and Warade *et al.* (2008).

The net monetary return of Rs. 87840 and B: C ratio (1:2.30) was found under application of Oxyfluorfen 0.08 kg ha⁻¹ before transplanting + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at 30 DAT followed by combined spray of Pendimethalin (0.30 kg ha⁻¹) + Quizalofop-p-ethyl 0.03 kg ha⁻¹ at the time of transplanting and at 30 DAT gave net monetary return of Rs. 75450 with B: C ratio 1: 2.04.

Among the various treatments application of Oxyfluorfen 23.5% EC before planting + Quizalofop ethyl 5 % EC at 30 days after transplanting (T2) recorded higher marketable bulb yield of 287.21 q ha⁻¹ followed by T6 (281.82 q ha⁻¹). The weed control efficiency was highest in T1 (89.86 %).

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