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Effect of Bio-efficacy and phytotoxicity of Fluroxypyr -Meptyl for broad leaf weed control in onion *(Allium cepa)*

S. DEIVASIGAMANI

Department of Agronomy, PGP College of Agricultural sciences, palani Nagar -637405, Namakkal, Tamil Nadu, India.

Abstract

A field experiment was conducted during kharif seasons of 2012-2013 at Department of Agronomy, Annamalai University, Tamilnadu, India. To study the effect of bio efficacy and phytotoxicity of different herbicides sprayed for broad leaf weed control in onion. The herbicides Fluroxypyr-meptyl 48EC @ 360 g.a.i (750 ml/ha) was applied at 15-20 DAP, that recorded the least weed counts, dry matter and highest weed control index of individual species viz., Amaranthus viridis, Boerhaavia diffusa, Trianthema portulacastrum, Euphorbia hirta etc. The weed dry matter production and weed control index favoring to give higher bulb yield of (80.0q/ha). Fluroxypyr-meptyl 48EC @ 324 g.a.i (675 ml/ha) and hand weeding were on par. Fluroxypyr-meptyl 48EC @ 300 g.a.i (625 ml/ha), Fluroxypyr-meptyl 48EC @252 g.a.i (525 ml/ha) and Pendimethalin 30EC@2500-3300ml/ha were next in order. No phytotoxicity symptoms was observed in the treatments including two times the recommended dose of Fluroxypyr-meptyl 48EC @ 360 g.a.i (750 ml/ha) and Fluroxypyr-meptyl 48EC @ 720 g.a.i (1499 ml/ha) in respect of leaf chlorosis, tip burning, leaf necrosis, leaf epinasty, hyponasty, vein clearing, wilting and rosetting etc.,

Key words: Onion, Bio-efficacy, Phytotoxicity, Fluroxypyr-meptyl, Pendimethalin.

I. Introduction

Onion 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 tones of production and average productivity of 14.2 metric tones/ha (Kalhapure, *et al.,* 2013). Onion has culinary, dietary and medicinal importance in daily life of Indian People and due to its export trade, it is also a major vegetable crop to gain foreign currency. Onion crop is slow growing, shallow rooted, narrow, upright leaves and non branching habit. Due to this type of growing habit, onion crop cannot compete well with the 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 is 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. Moreover, weeding during critical growth stages is very difficult due to increased cost of human labours and its scarce availability. On the other hand, use of herbicides alone does not prove effective for weed control due to their spectrum of weed kill. Hence an attempt was made to find out the chemical weed management practices for weed control in onion, which is practically effective and economically feasible for farmers.

The above fact in view, an experiment was conducted to study the bio efficacy of Fluroxypyr-

meptyl on weeds and onion under irrigated conditions.

II. Materials and methods

Experiments were conducted at Kurinjipadi nearby Meenakshipettai Village, Cuddalore District, Tamilnadu, during 2011-2012, the experimental site located at 11 °56 ' N Latitude 79 °59 ' E longitude at an altitude +5.79 M above mean sea level. The soils of the experimental site Red loamy soil with a pH of 7.8 and EC of 0.46 M.mhos/cm^{-1}, low in available nitrogen (210 kg ha^{-1}), medium in available phosphorus (17.96kg ha^{-1}) and high in available potassium (320.8 kg ha^{-1}). Six different treatments (Table.1) compared and were laid out in randomized block design with four replications. The onion bulbs CO-5 were transplanted in the month of July during 2012 and 2013 at a spacing of 45 cm x 10 cm on farming ridges and furrows. All the recommended package of practices was followed for raising the onion crop. The herbicides were sprayed pre emergence at 3 DAP and post emergence 15-20 DAP when weeds are at 3-4 leaf stage as per the treatment details given in table 1 and 2 by using knapsack sprayer fitted with flood jet nozzle spray volume of 500lit/ha as per the treatments. Weed density and dry weight of weeds were recorded at 30 and 45 days after application of crop by placing a quadrate of 50 cm x 50 cm randomly from three places in each plot. Weed control efficiency was calculated by the formula given below.

$$WCE(\%) = \frac{WDC - WDT}{WDC} x100$$

Where: WCE: Weed control efficiency; WDC: Weed dry matter in control; WDT: Weed dry matter in treatment.

The phytotoxicity symptoms were observed in respect of leaf chlorosis, tip burning, necrosis, epinasty, hyponasty, vein clearing, wilting and rosetting.

III. Results and Discussion

Effect on weeds

The predominant broad leaf weed species in the experimental field were *Amaranthus viridis, Boerhaavia diffusa, Trianthema portulacastrum, Euphorbia hirta* etc. All treatments showed significant reduction in total weed density and dry matter production of weeds as compared to untreated control during the seasons (table 1). Among the herbicides compared, application of Fluroxypyr-meptyl 48EC @ 360 g.a.i (750 ml/ha) performed superior with the least weed populations, weed dry matter and highest weed control indices at 30 and 45 DAA, respectively. Fluroxypyr-meptyl 48EC @ 324 g.a.i (675 ml/ha) and hand weeding were on par. Fluroxypyr-meptyl 48EC @ 300 g.a.i (625 ml/ha), Fluroxypyr-meptyl 48EC @ 252 g.a.i (525 ml/ha) and Pendimethalin 30EC @ 750-1000 g.a.i (2500-3300 ml/ha) were next in order. Similar results were obtained by the earlier (Kolhe, 2001: Warde *et al*., 2006). All the treatments were significantly superior to the untreated control due to lesser weed counts of individual weed species. Untreated control recorded the highest weed dry matter production because of profuse weeds growth at 30 and 45 DAA.

Effect on crop

The highest bulb yield of 80.0q/ha was observed with the treatment of Fluroxypyr-meptyl 48EC @ 360 g.a.i (750 ml/ha). The herbicide Fluroxypyr-meptyl 48EC @ 324 g.a.i (675 ml/ha) and hand weeding were on par. Fluroxypyr-meptyl 48EC @ 300 g.a.i (625 ml/ha), Fluroxypyr-meptyl 48EC @ 252 g.a.i (525 ml/ha) and Pendimethalin 30EC @ 750-1000 g.a.i (2500-3300 ml/ha) were next in order. These all the treatments were significantly superior to the untreated control that recorded the least bulb

yield of 45.0q/ha. The higher bulb yields due to herbicide treatment could be attributed to efficient control of weeds throughout the critical periods of crop growth. These results are in close conformity with the earlier findings of (Sukhadia *et al.,* 2002: Chopra and Chopra, 2007: Kalhapure *et al.,* 2013).

The better performance of Fluroxypyr-meptyl 48EC @ 360 g.a.i (750 ml/ha) and Fluroxypyr-meptyl 48EC @ 324 g.a.i (675 ml/ha) is attributed to efficient and safe weed control. No phytotoxity symptoms was observed in all the treatments including two times recommended dose of (750ml/ha and 1499 ml/ha) in respect of leaf chlorosis, tip burning, necrosis, epinasty, hyponasty, vein clearing, wilting and rosetting.

Present study concluded that application of Fluroxypyr-meptyl 48EC @ 360 g.a.i (750 ml/ha), Fluroxypyr-meptyl 48EC @ 324 g.a.i (675 ml/ha) and hand weeding at 20 and 40 offered significantly higher weed control in onion during this seasons and also increased the bulb yield significantly, compared to all other treatments.

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Table 1: Effect of bio efficacy on different herbicide sprayed on weed count at 30 and 45 DAA / m^2

Treatment	*Amaranthus viridis*		*Boerhaavia diffusa*		*Trianthema portulacastrum*		*Euphorbia hirta*	
	30 DAS	**45 DAS**	**30 DAS**	**45 DAS**	**30 DAS**	**45 DAS**	**30 DAS**	**45 DAS**
Fluroxypyr-meptyl 48EC (525 ml/ha)	(3.0) 1.87	(5.0) 2.34	(3.5) 2.0	(4.5) 2.23	(3.0) 1.87	(4.0) 2.12	(3.5) 2.0	(3.0) 1.87
Fluroxypyr-meptyl 48EC (625 ml/ha)	(3.0) 1.87	(4.0) 2.12	(3.0) 1.87	(3.0) 1.87	(3.0) 1.87	(2.0) 1.58	(3.0) 1.87	(2.0) 1.58
Fluroxypyr-meptyl 48EC (675 ml/ha)	(2.0) 1.58	(3.0) 1.87	(3.0) 1.87	(4.0) 2.12	(2.0) 1.58	(2.0) 1.58	(2.0) 1.58	(3.0) 1.87
Fluroxypyr-meptyl 48EC (750 ml/ha)	(1.0) 1.22	(1.0) 1.22	(2.0) 1.58	(2.5) 1.73	(1.0) 1.22	(1.0) 1.22	(2.0) 1.58	(1.0) 1.22
Pendimethalin 30EC (2500-3300 ml/ha)	(4.0) 1.87	(3.0) 1.87	(4.0) 2.12	(5.0) 2.34	(4.0) 2.12	(3.0) 1.87	(4.0) 2.12	(3.0) 1.87
Two hand weeding 20 and 40 DAP	(2.5) 1.73	(0.00) 0.01	(4.0) 2.12	(0.00) 0.01	(3.0) 1.87	(0.00) 0.01	(3.0) 1.87	(0.00) 0.01
Untreated control	(8.0) 2.91	(13.0) 3.67	(7.0) 2.73	(15.0) 3.93	(7.0) 2.73	(14.0) 3.80	(10.0) 3.24	(15.0) 3.93
S.ED	0.18	0.32	0.14	0.19	0.18	0.18	0.21	0.32
CD (P=0.05)	0.36	0.65	0.29	0.39	0.36	0.36	0.42	0.65

Figures in parenthesis are original values before square root transformation $\sqrt{(X+0.5)}$

Table 2: Effect of bio efficacy on different herbicide sprayed on weed biomass (g) / m^2 at 30 and 45 DAA

Treatment	*Amaranthus viridis*		*Boerhaavia diffusa*		*Trianthema portulacastrum*		*Euphorbia hirta*	
	30 DAS	**45 DAS**	**30 DAS**	**45 DAS**	**30 DAS**	**45 DAS**	**30 DAS**	**45 DAS**
Fluroxypyr-meptyl 48EC (525 ml/ha)	65.0	50.0	63.0	46.2	86.0	75.0	58.1	48.2
Fluroxypyr-meptyl 48EC (625 ml/ha)	59.0	45.0	52.0	43.0	80.0	64.0	45.1	37.4
Fluroxypyr-meptyl 48EC (675 ml/ha)	56.0	44.0	45.5	33.0	76.0	67.0	45.0	37.5
Fluroxypyr-meptyl 48EC (750 ml/ha)	45.0	37.0	43.0	35.0	74.5	65.0	41.0	34.1
Pendimethalin 30EC (2500-3300 ml/ha)	63.0	49.0	59.0	44.5	84.0	72.0	56.7	40.3
Two hand weeding 20 and 40 DAP	57.0	0.0	45.0	0.0	75.0	0.0	46.0	0.0
Untreated control	80.0	97.0	78.0	90.0	104.0	122.0	78.0	89.0
S.ED	2.25	3.5	1.25	1.0	0.75	1.0	1.0	1.7
CD (P=0.05)	4.5	7.0	2.5	2.0	1.5	2.0	4.0	3.4

Table 3: Effect of bio efficacy on herbicide different sprayed weed control index / m^2 at 30 and 45 DAA and bulb yield q/ha

Treatment	*Amaranthus viridis*		*Boerhaavia diffusa*		*Trianthema portulacastrum*		*Euphorbia hirta*		**Bulb Yield (Q/ha)**
	30 DAS	**45 DAS**	**30 DAS**	**45 DAS**	**30 DAS**	**45 DAS**	**30 DAS**	**45 DAS**	
Fluroxypyr-meptyl 48EC (525 ml/ha)	(18.75) 25.65	(48.45) 44.11	(19.23) 26.00	(48.66) 44.23	(17.30) 24.57	(38.52) 38.36	(25.51) 30.33	(45.84) 42.61	65.0
Fluroxypyr-meptyl 48EC (625 ml/ha)	(26.25) 30.82	(53.60) 47.06	(33.33) 35.26	(52.22) 46.27	(23.07) 28.70	(63.93) 53.08	(42.17) 40.49	(57.97) 49.58	70.0
Fluroxypyr-meptyl 48EC (675 ml/ha)	(30.0) 33.21	(54.63) 47.65	(42.30) 40.57	(63.33) 52.73	(26.92) 31.25	(45.08) 42.17	(42.30) 40.57	(57.86) 49.52	75.0
Fluroxypyr-meptyl 48EC (750 ml/ha)	(40.0) 39.23	(61.18) 51.46	(44.87) 42.05	(61.11) 51.41	(28.36) 32.17	(46.72) 43.11	(47.43) 43.52	(61.68) 51.75	80.0
Pendimethalin 30EC (2500-3300 ml/ha)	(21.25) 27.45	(49.48) 44.70	(24.35) 29.56	(43.33) 41.16	(19.23) 26.00	(40.98) 39.80	(27.30) 31.49	(54.71) 47.70	67.5
Two hand weeding 20 and 40 DAP	(36.25) 37.01	(100.0) 0.01	(38.46) 38.32	(100.0) 0.01	(32.69) 34.87	(100.0) 0.01	(41.02) 39.82	(100.0) 0.01	69.0
Untreated control	-	-	-	-	-	-	-	-	45.0
S.ED	3.0	2.0	1.25	0.66	1.85	1.85	0.47	1.47	1.11
CD (P=0.05)	6.0	4.0	2.50	1.30	3.70	3.70	0.94	2.95	2.23

Figures in parenthesis are original values before angular transformation.

