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Bio-efficacy of 2, 4-D Ethyl Ester 80% EC in Non-crop area

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Abstract

A field experiment was conducted during pre-kharif season of 2014 and 2015 at the Directorate of Research building, Bidhan Chandra Krishi Viswavidyalaya, Kalyani to find out the bio-efficacy of 2, 4-D Ethyl Ester 80% EC on Non-crop area. The experiment was designed with eight treatments (weed management practices) and tested under Randomized Block Design with three replications. The weed management practices comprised of different doses of 2,4-D Ethyl Ester 80% EC, single dose of Glyphosate 41%SL and hand weeding. The lowest weed density was recorded in hand weeding plots. Among the chemicals 2,4-D Ethyl Ester 80% EC @ 1.8 kg a.i. ha⁻¹ in case of broad leave weeds and Glyphosate 41% SL @ 0.45 kg a.i. ha⁻¹ in case of sedges and grasses followed hand weeding on minimum weed density. Hand weeding resulted the minimum weed dry weight which was followed by 2,4-D Ethyl Ester 80% EC @ 1.8 kg a.i. ha⁻¹. The highest weed control efficiency among the chemicals was found in 2,4-D Ethyl Ester 80% EC @ 1.8 kg a.i. ha⁻¹ which follows hand weeding. From the present experiment, it can be concluded that the spraying of 2,4-D Ethyl Ester 80% EC @ 1.8 kg a.i. ha⁻¹ would result in effective control of weeds in Non-crop area of West Bengal

Keywords: Non-crop, weed management, 2, 4-D Ethyl Ester 80% EC, hand weeding

Introduction

There is a marked increase in non-crop area due to growing economic conditions in India. In addition to the existing waste lands, cultivated lands are being kept fallow for several purposes. These fallow lands are infested with the obnoxious weeds like *Lantana camara*, *Ageratum houstonianum*, *Mikania micrantha*, *Parthenium hysterophorus*. According to Sekar *et al.*, (2012) [7] highest number (48%) of invasive species are found in wasteland areas. Mukhopadhyay (1993) [4] reported that Parthenium, an invasive alien weed would be dominant in India. Presently it is a major weed in dry land crops causing yield decline in several crops (Tanveer *et al.*, 2015) [9]. Construction of roads facilitates transportation of seeds and other propagules of different invasive weeds for further dispersal. So, management of weed flora in non crop areas becomes prime importance for preventing a serious weed problem in agro ecosystem. Complete control of Parthenium has been reported with applications of ethyl ester of 2,4-D in non-cropped areas (Muniyappa and Krishnamurthy, 1976) [5]. Thus in this experiment, different dose of 2, 4-D Ethyl Ester 80% EC were tested as the non crop areas are often heavily infested with several broad leaf weeds.

Materials and Methods

A field experiment was conducted at of Research building of Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia (23.5°N, 89°E and 9.75 m altitude) during kharif season of 2014 and 2015. The experiment was laid out in randomized block design (RBD), replicated thrice with eight treatments [2, 4-D Ethyl Ester 80% EC @ 0.45 a.i. kg ha⁻¹, 2, 4-D Ethyl Ester 80% EC @ 0.90 a.i. kg ha⁻¹, 2, 4-D Ethyl Ester 80% EC @ 1.35 a.i. kg ha⁻¹, 2, 4-D Ethyl Ester 80% EC @ 1.80 a.i. kg ha⁻¹, 2, 4-D Ethyl Ester 38% EC @ 1.35 a.i. kg ha⁻¹, Glyphosate 41% SL@ 1.230 a.i. kg ha⁻¹, Hand weeding, Unweeded control] in 5.0 x 4.0 m size plots. Herbicides were applied using 500 liters of water ha⁻¹ with a flat fan nozzle attached in a high volume Knapsack sprayer as per schedule. Observations on weed density, weed dry weight were recorded and analyzed using the analysis of variance technique. Weed control efficiency (Mani *et al.*, 1973) [3] was calculated by using the following formula:

$$\text{Weed control efficiency (\%)} = \frac{\text{Dry weight of weeds in unweeded control} - \text{Dry weight weeds in treatment plot}}{\text{Dry weight of weeds in unweeded control}} \times 100$$

Results and Discussion

Weed flora

The dominant weed flora in the experimental area consisted of (i) Grasses: *Cynodon dactylon*, *Imperata cylindrica*, *Digitaria sanguinalis*, *Dactyloctenium aegyptium*, *Echinochloa colona*, *Eleusine indica*, (ii) Sedges: *Cyperus rotundus* and (iii) Broad Leaves: *Lantana camara*, *Ageratum houstonianum*, *Mikania micrantha*, *Parthenium hysterophorus* etc. Similar findings were also observed by Angiras, 2014; Jana, 2016^[1,2].

Effects on weeds

At 20, 40 and 60 DAA (days after application) unweeded control treatment plots recorded the highest density for grasses, sedges and broad leaf weeds (Table 1). Density was lowest for all types of weeds in hand weeding. Among the chemical treatments 2, 4-D Ethyl Ester 80% EC @ 1.8 a.i. kg ha⁻¹ significantly reduced the broad leaf weed density which

was statistically at par with hand. This corroborated the findings of Singh *et al.*, 2005^[8]. On the other hand Glyphosate 41 % SL @ 0.45 a.i. kg ha⁻¹ resulted best among the chemicals in reducing sedges and grassy weed counts as also found by Opena *et al.*, 2014^[6] in their experiment.

The total weed dry weight was highest in unweeded control treatment plots at all the observations (Table 2). Hand weeding recorded the lowest total weed dry weight in all the observations for each category of weeds. Among the herbicides 2, 4-D Ethyl Ester 80% EC @ 1.8 a.i. kg ha⁻¹ significantly reduced the total weed dry weight.

Weed control efficiency

Hand weeding noted the highest weed control efficiency (Table 2). Weed control efficiency was lower in case of lower doses of 2,4-D Ethyl Ester 80% EC. However, 2, 4-D Ethyl Ester 80% EC @ 1.8 a.i. kg ha⁻¹ recorded the higher weed control efficiency which closely followed the hand weeding.

Table 1: Effect of different weed management treatments on weed density (Two years pooled data)

Treatment	Broad leaves			Sedges			Grasses		
	20 DAA	40 DAA	60 DAA	20 DAA	40 DAA	60 DAA	20 DAA	40 DAA	60 DAA
2, 4-D Ethyl Ester 80% EC @ 0.45 a.i. kg ha ⁻¹	57.36	75.53	90.32	50.45	55.35	64.90	120.42	132.55	145.45
2, 4-D Ethyl Ester 80% EC @ 0.90 a.i. kg ha ⁻¹	47.04	68.32	82.43	46.55	52.40	61.53	115.50	125.45	133.58
2, 4-D Ethyl Ester 80% EC @ 1.35 a.i. kg ha ⁻¹	32.38	32.52	64.77	43.34	45.53	55.97	112.42	120.25	128.69
2, 4-D Ethyl Ester 80% EC @ 1.80 a.i. kg ha ⁻¹	23.65	30.40	43.90	40.34	42.58	52.44	105.79	116.35	118.47
2, 4-D Ethyl Ester 38% EC @ 1.35 a.i. kg ha ⁻¹	35.31	34.29	60.20	42.63	44.84	56.94	118.79	122.47	130.58
Glyphosate 41 % SL @ 0.45 a.i. kg ha ⁻¹	36.16	38.50	62.30	32.44	36.27	44.45	45.40	65.48	84.48
Hand weeding	17.52	27.55	40.37	20.40	29.50	38.55	34.80	48.56	63.67
Unweeded control	81.08	125.57	154.61	58.65	64.70	81.27	172.48	182.73	210.20
S. Em(+)	1.99	2.25	1.69	2.14	2.22	2.45	2.98	3.14	2.84
CD (P= 0.05)	6.04	6.84	5.14	6.51	6.75	7.44	9.05	9.52	8.62

Table 2: Effect of different weed management treatments on total weed dry weight, weed control efficiency

Treatment	Total weed dry matter production (g m ⁻²)			Weed Control Efficiency (%)		
	20 DAA	40 DAA	60 DAA	20 DAA	40 DAA	60 DAA
2, 4-D Ethyl Ester 80% EC @ 0.45 a.i. kg ha ⁻¹	49.39	52.25	58.44	64.14	65.49	65.56
2, 4-D Ethyl Ester 80% EC @ 0.90 a.i. kg ha ⁻¹	41.33	46.58	54.38	69.99	69.23	67.95
2, 4-D Ethyl Ester 80% EC @ 1.35 a.i. kg ha ⁻¹	30.04	39.81	43.40	78.19	73.71	74.42
2, 4-D Ethyl Ester 80% EC @ 1.80 a.i. kg ha ⁻¹	18.48	23.42	26.91	86.58	84.53	84.14
2, 4-D Ethyl Ester 38% EC @ 1.35 a.i. kg ha ⁻¹	35.27	40.43	44.53	74.40	73.30	73.76
Glyphosate 41 % SL @ 0.45 a.i. kg ha ⁻¹	39.22	44.12	48.30	71.53	70.86	71.53
Hand weeding	10.32	16.45	21.38	92.51	89.13	87.40
Unweeded control	137.74	151.40	169.67	0.00	0.00	0.00
S. Em(+)	1.72	2.21	2.16			
CD (P= 0.05)	5.24	6.73	6.56			

(Two years pooled data)

Conclusion

Considering the weed density, total weed dry weight in the experimental plots and weed control efficiency of the treatments, it can be concluded that chemical methods through 2, 4-D Ethyl Ester 80% EC @ 1.8 a.i. kg ha⁻¹ can replace hand weeding in the non crop areas as it is lesser labour intensive and incurs lesser labour cost. Hence, it can be recommended for weed management in the non crop areas of West Bengal.

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