IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 9, Issue 7 Ver. I (July 2016), PP 25-28
www.iosrjournals.org

Efficacy of Herbicides to Control the *Chromolaena Odorata* under Waste Land Situation

Kumar Naik, A. H., Ramachandra Prasad, T.V. and Basavaraja Naik, T.
Directorate of Weed Science Research Centre, University of Agricultural Sciences, Hebbal, Bangalore

***Abstract*:** *Field trial was conducted at two locations to study the efficiency of herbicide on existing and cut plants of Chromolaena. The experiment consisted of 18 herbicidal treatments involving glyphosate 41 SL 0.4, 0.8, 1.2 and 1.6 kg ai ha^{-1}, paraqat 24 SL 0.4, 0.6, 0.8 and 1.0 kg ai ha^{-1}, chlorimuron ethyl 10WP + metsulfuron methyl 10 WP (Almix 20WP) 2.0, 3.0, 4.0 and 5.0 g ha^{-1}, 2,4-D Na Salt 80 WP 1.0, 1.5, 2.0 and 2.5 kg ai ha^{-1}. These herbicidal treatments were compared with manually cutting and unsprayed control. The design of experiment was Random Block Design with 3 replications. Glyphosate application caused 5 to 9% and 45 to 55% on 10th and 20th day after spraying in both Chromolaena de -topped and old plants respectively. However, subsequently the plants drying increased to 35 to 45% and 73% to 79% on 30th day after spraying respectively. By 40th day onwards, complete drying of Chromolaena was observed at all doses. Whereas, Re - sprouting of Chromolaena was observed in 2, 4-D Na salt sprayed plot particularly from 70th and 60th day onwards. It was to an extent of 8 to 13% and5 to 10% by 90th day after spray at all concentration. Application of Chlorimuron ethyl 10WP + metsulfuron methyl 10 WP caused slight initial sprouting up to 40th and 20th day onwards and subsequently no growth was observed at all concentration in both Chromolaena de -topped and old plants. However, Usage of herbicides at all concentrations was cheaper than manual weeding. Among herbicides use of chlorimuron ethyl 10WP + metsulfuron methyl 10 WP was the cheaper, as compared to glyphosate or paraquat application*

Keywords: *Chromolaena odorata glyphosate, paraqat, chlorimuron ethyl,*

I. Introduction

Chromolaena odorata (*Eupatorium odoratum* L.) (Asteraceae: Eupatoriae) is a perennial shrub native to the tropical Americas. *Chromolaena odorata* looks similar to *Ageratum* species but has a growth habit similar to *Lantana camera*. Siam weed is fast growing woody and much branched shrub attaining height of three to eight meter. The leaves are soft green, hairy and roughly triangular in shape with a distinctive three vein pattern. The stem is smooth, round and fairy brittle, becoming woody at the base when old and plant has no prickles. In Karnataka *Chromolaena* plants flowers from October to January – February months, producing masses of pale lilac flowers that appear white from a distance and these turn a darker pink when matured. Within 8-10 weeks of flowering, masses of small brown seeds are produced rapidly, which is estimated to be 93,000- 1,60,000 tiny seeds/ plant, each seed has a tuft of white hairs allowing it to be carried by the wind and water. Seeds also have tiny barbs that stick to clothing, footwear, animals, vehicles and machinery (Ramachandra Prasad *et al*., 2004). Despite all the efforts, today around the world, many countries biodiversity are under threat of establishment of invasive species, which require eradication or control programs. Looking into all these problems created by this weed can be explored by using herbicide in restricted areas particularly in plantation crops or cropped fields. This aspect could be capitalized in the management of the weed and to conserve bio diversity.

II. Materials and Methods

The experiment was conducted at GKVK, University of Agricultural Sciences, Bangalore at two locations in different seasons. The GKVK is situated at latitude of $12^0$88' North, longitude of $77^0$35' East and at altitude of 930 meter above mean sea level. The investigation consisted of two plants i.e. old plant and cut plants of *Chromolaena odorata*, it was intended to find out different concentration of herbicides with different time of spraying (August and November). The experiment was laid out with 18 treatments in a Randomised complete block design with these replications in naturally grown *Eupatorium* (6 months old). The same set of experiment was also laid out on sprouted *chromolaena* (two months old, after cutting the old plants of *chromolaena*). Each herbicide was sprayed separately with different concentrations using a hand operated knapsack sprayer fitted with flood jet nozzle, *Eupatorium* by using a spray volume of 750 litres per ha. The herbicides were sprayed uniformly covering all areas of the plots and the control treatment was sprayed with water.

III. Results and Discussion

Percent drying of plants: Glyphosate application caused 5 to 9% and 45 to 55% on 10th and 20th day after spraying in both *Chromolaena* de -topped and old plants respectively. However, subsequently the plants drying

increased to 35 to 45% and 73% to 79% on 30th day after spraying respectively. By 40th day onwards, complete drying of *Chromolaena* was observed at all doses. In glyphosate spray at all concentration, there was no re -sprout of *Chromolaena* upto 90th day after spraying. Compared to glyphosate, paraquat application caused higher mortality of *Chromolaena*, plant dried completely 100%, on 10th after spraying. There was no re -sprouting of *Chromolaena* up to 90th day after spraying at all concentrations.

Spraying of chlorimuron ethyl 10WP + metsulfuron methyl 10 WP did not cause any mortality up to 20th day after spraying at all concentrations. By 30th day after spray, about 8 to 15% and 2 to 10% of *Chromolaena* plants showed drying both de -topped and old plants respectively 2,4-D Na salt sprayed *Chromolaena* did not show drying up to 40th day after spray. Subsequently 3 to 4 and 3 to 8 % plant showed mortality at 50th day after spraying and 7 to 10% and 14 to 23% from 70th day after spraying. By 90th day after spraying, 2,4-D Na salt at all doses was able to cause 7 to 9%and14 to 23% drying in *Chromolaena* respectively (Table 1). Mummigatti, 1994 and Doddamani *et al*. 2001 revealed similar results were application of glyphosate lowered the relative water content, stomatal conductance and transpiration rate with concomitant increase in leaf temperature and resulting in death of plants. The studies conducted by Kulshreshta *et al*. (1981) drying of *Chromolaena odorata* was found to be more in older plants (10 years and above) than the younger plants (<5 years). Touchme, 1980, Singh *et al*. (1992) reported that paraquat at 1.0 kg ha^{-1} and glyphosate at 1.0 kg ha^{-1} were found to be most effective in checking *Chromolaena odorata* in Himachal Pradesh. Although 2,4-D suppressed the weed growth, but failed to control completely.

Spraying of chlorimuron ethyl 10WP + metsulfuron methyl 10 WP did not cause any drying up to 20th day after spraying. By 30th day after spray *Chromolaena* plants showed drying. Subsequently percent drying of plants showed in gradual increase both old and de -topped plants. Anon, 2008 and Abraham *et al*. 2008 revealed similar results.

Re sprouting: Re -sprouting of *Chromolaena* was observed in 2, 4-D Na salt sprayed plot particularly from 70th and 60th day onwards. It was to an extent of 8 to 13% and5 to 10% by 90th day after spray at all concentration. Application of Chlorimuron ethyl 10WP + metsulfuron methyl 10 WP caused slight initial sprouting up to 40th and 20th day onwards and subsequently no growth was observed at all concentration in both *Chromolaena* de -topped and old plants. While. 2, 4-D Na Salt sprayed plot particularly from 60th day onwards Similar kind of results noticed by Ivens (1974) observed that picloram at 0.4 kg +2,4-D amine at 1.6 kg ha^{-1} after six months of application. These herbicides were more effective on plants emerging from re-sprout after slashing than on unslashed plants. Picloram persisted in the soil for seven months after application, while 2,4-D was less persistent.

Where as, glyphosate and paraquat application did not show any re sprout in both old and de -topped plants of *Chromolaena*. Doddamani (1992) reported that *Chromolaena* can be effectively controlled by spraying glyphosate and 2,4-D both at 7.5 ml/lit. However, the lower concentrations of these herbicides were effective only at early growth stages and did not control the re-growth of *Chromolaena* at later stages. It was also pointed out that glyphosate is environmentally safe with no mammalian toxicity as compared to 2,4-D. similar findings were also observed by Mogali *et al.* 1989 (Table 2).

Economics of *Chromolaena* management: Usage of herbicides at all concentrations was cheaper than manual weeding. Among herbicides use of chlorimuron ethyl 10WP + metsulfuron methyl 10 WP was the cheaper, as compared to glyphosate or paraquat application, but slightly cheaper than 2,4-D Na salt. The cost on herbicides increased with increase in dose of herbicides. Use of glyphosate was costlier than paraquat. (Abraham *et al*., 2008) are also observed the similar results (Table 3).

References

[1]. Anonymous, 2008. Herbicides for Control of Chromolaena odorata. Annual Progress Report. Kerala Agricultural University. PP 20-26.

[2]. Abraham, T., George Thomas, C. and Joseph, P.A. 2008. Herbicides for Control of Chromolaena odorata Kerala Agricultural University, Trichur - 680 654, India.

[3]. Doddamanni, M.B., 1992. Studies on physiological and biochemical changes in Chromolaena odorata as influenced by herbicides and its allelopathic effects. Ph.D. (Agri.) Thesis, University of Agricultural Sciences, Dharwad.

[4]. Doddamanni, M.B., Mummigatti, U.V., Nadagoudar, B.S. and Chetti, M.B., 2001. Influence of chemical and conventional methods of weed control on Chromolaena odorata. Alien Weeds in moist Tropical Zones: Banes and Benefits, 139-142. Kerala.

[5]. Ivens, G.W., 1974. The problem of Eupatorium odoratum. L. In Nigeria, PANS. **20**: 76-82

[6]. Kulshreshta, Yaduraj, N.J. and Mani, V.S., 1981. Dissipation to butachlor and propanil herbicides in rice crop. In Proc. Of 8th Asian Pac. Weed Sci. Conf., Bangalore, p 467-474.

[7]. Mummigatti, U.C., 1994. Effect of herbicides, growth conditions and carriers on physiological, Biochemical and anatomical changes in Eupatorium (Chromolaena odorata K and R). Ph.D. Thesis submitted to the University of Agricultural Sciences, Dharwad.

[8]. Mogali, S.G., Nimbal, C.I. and Hosmani, M.M., 1989. Effect of herbicides on the control of Eupatorium re growth. Karnataka J. Agric.Sci., **2**(4): 1317-1320.

[9]. Ramachandra Prasad, T.V., Kiran Kumar, V.K., Devendra, R. and Channabasavegowda, R., 2006. Parthenium hysterophorus L: A

National weed, its menace and integrated management strategies. Extension Folder, AICRP on weed control, Univ.Agric. sci., Bangalore.

[10]. Singh, C.M., Mohantry, R.K. and Suresh Kumar, 1992. Biology and control of E. adenophorum in Himachal Pradesh. Indian J. Weed Sci: **24**:62-64.

[11]. Tehoume, M., 1980. Morphology and biology of Chromolaena odorata (L.) King and Robinson (Compositae). Proceedings of 6th Asian- Pacific Weed Science Social Conference, p.72.

Table 1. Influence of herbicides on percent drying of *Chromolaena odorata* plants at different growth stages - 10 days interval on existing old plants and sprouted de-topped plants at GKVK, Bangalore, during 2013. (After spraying of herbicides)

Treatments		Old plants % (DASp)									De-topped plants % (DASp)								
		10 DAS	20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS	10 DAS	20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS
T 1	Glyphosate 41 SL 0.4 kg ai ha^{-1}	0	30	35	100	100	100	100	100	100	0	45	73	100	100	100	100	100	100
T 2	Glyphosate 41 SL 0.8 kg ai ha^{-1}	0	31	38	100	100	100	100	100	100	0	48	75	100	100	100	100	100	100
T 3	Glyphosate 41 SL 1.2 kg ai ha^{-1}	5	39	44	100	100	100	100	100	100	0	51	79	100	100	100	100	100	100
T 4	Glyphosate 41 SL 1.6 kg ai ha^{-1}	9	40	45	100	100	100	100	100	100	0	55	79	100	100	100	100	100	100
T 5	Paraqat 24 SL 0.4 kg ai ha^{-1}	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
T 6	Paraqat 24 SL 0.6 kg ai ha^{-1}	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
T 7	Paraqat 24 SL 0.8 kg ai ha^{-1}	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
T 8	Paraqat 24 SL 1.0 kg ai ha^{-1}	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
T 9	CME ± MSM 20 WP 2.0 g ha^{-1}	0	0	8	26	44	100	100	100	100	0	0	6	7	14	20	25	25	25
T 10	CME ± MSM 20 WP 3.0 g ha^{-1}	0	0	9	30	42	100	100	100	100	0	0	5	7	22	18	40	40	45
T 11	CME ± MSM 20 WP 4.0 g ha^{-1}	0	0	11	34	44	100	100	100	100	0	0	10	11	27	33	41	41	47
T 12	CME ± MSM 20 WP 5.0 g ha^{-1}	0	0	15	35	48	100	100	100	100	0	0	12	17	29	37	44	44	54
T 13	2,4-D Na salt 80 WP 1.0 kg ai ha^{-1}	0	0	0	0	2	6	7	7	7	0	0	0	0	4	9	16	16	16
T 14	2,4-D Na salt 80 WP 1.5 kg ai ha^{-1}	0	0	0	0	3	6	8	8	8	0	0	0	0	6	10	17	17	17
T 15	2,4-D Na salt 80 WP 2.0 kg ai ha^{-1}	0	0	0	0	4	7	9	9	9	0	0	0	0	3	6	14	14	14
T 16	2,4-D Na salt 80 WP 2.5 kg ai ha^{-1}	0	0	0	0	3.5	7	10	10	10	0	0	0	0	8	10	23	23	23
T 17	Manual Cutting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T-18	Unsprayed control	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: CME ± MSM 20 WP = Chlorimuron ethyl 10WP + metsulfuron methyl 10 WP

Table 2. Influence of herbicides on number of *Chromolaena odorata* plants Showing re-sprouting ability at different stages of growth on existing old plants and sprouted de-topped plants -10 days interval at GKVK, Bangalore, during 2013. (After spraying of herbicides)

Treatments		Old plants (DASp)									De-topped plants (DASp)								
		10 DAS	20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS	10 DAS	20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS
T 1	Glyphosate 41 SL 0.4 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 2	Glyphosate 41 SL 0.8 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 3	Glyphosate 41 SL 1.2 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 4	Glyphosate 41 SL 1.6 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 5	Parsqat 24 SL 0.4 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 6	Parsqat 24 SL 0.6 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 7	Parsqat 24 SL 0.8 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 8	Parsqat 24 SL 1.0 kg ai ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 9	CME ± MSM 20 WP 2.0 g ha^{-1}	0	1	2	2	0	0	0	0	0	0	4	6	8	8	8	8	8	8
T10	CME ± MSM 20WP 3.0 g ha^{-1}	0	2	3	3	0	0	0	0	0	0	2	3	5	5	5	5	5	5
T 11	CME ± MSM 20WP 4.0 g ha^{-1}	0	1	1	0	0	0	0	0	0	0	1	2	3	3	3	3	3	3
T 12	CME ± MSM 20WP 5.0 g ha^{-1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T 13	2,4-D Na salt 80 WP 1.0 kg ai ha^{-1}	0	0	0	0	0	0	7	8	9	0	0	0	0	0	8	10	10	10
T 14	2,4-D Na salt 80 WP 1.5 kg ai ha^{-1}	0	0	0	0	0	0	6	12	13	0	0	0	0	0	7	7	8	8
T 15	2,4-D Na salt 80 WP 2.0 kg ai ha^{-1}	0	0	0	0	0	0	6	8	9	0	0	0	0	0	5	6	6	6
T 16	2,4-D Na salt 80 WP 2.5 kg ai ha^{-1}	0	0	0	0	0	0	8	8	8	0	0	0	0	0	5	5	5	5
T 17	Manual Cutting	0	9	38	41	45	49	49	49	49	0	11	31	38	42	44	44	44	44
T-18	Unsprayed control	0	0	0	0	4	6	7	12	15	0	0	0	0	0	4	6	9	10

Note: CME ± MSM 20 WP = Chlorimuron ethyl 10WP + metsulfuron methyl 10 WP

Table 3. Economics of *Chromolaena odorata* as influenced by herbicides at GKVK, Bangalore, during 2013.

	Treatments	Old plants		De-topped plants
		Cost ha^{-1}(Rs.)		Cost ha^{-1}(Rs.)
T 1	Glyphosate 41 SL 0.4 kg ai ha^{-1}	714		3714
T 2	Glyphosate 41 SL0.8 kg ai ha^{-1}	1178		4178
T 3	Glyphosate 41 SL1.2 kg ai ha^{-1}	1645		4645
T 4	Glyphosate 41 SL1.6 kg ai ha^{-1}	2106		5106
T 5	Paraqat 24 SL 0.4 kg ai ha^{-1}	723		3723
T 6	Paraqat 24 SL 0.6 kg ai ha^{-1}	962		3962
T 7	Paraqat 24 SL 0.8 kg ai ha^{-1}	1199		4199
T 8	Paraqat 24 SL 1.0 kg ai ha^{-1}	1438		4438
T 9	CME ± MSM 20 WP 2.0 g ha^{-1}	425		3425
T 10	CME ± MSM 20 WP 3.0 g ha^{-1}	512		3512
T 11	CME ± MSM 20 WP 4.0 g ha^{-1}	600		3600
T 12	CME ± MSM 20 WP 5.0 g ha^{-1}	687		3687
T 13	2,4-D Na salt 80 WP 1.0 kg ai ha^{-1}	477		3477
T 14	2,4-D Na salt 80 WP 1.5 kg ai ha^{-1}	592		3592
T 15	2,4-D Na salt 80 WP 2.0 kg ai ha^{-1}	705		3705
T 16	2,4-D Na salt 80 WP 2.5 kg ai ha^{-1}	819		3819
T 17	Manual Cutting	3000		6000
T 18	Unsprayed control	-		3000

Note: CME ± MSM 20 WP = Chlorimuron ethyl 10WP + metsulfuron methyl 10 WP

Cost of inputs, (Rs./ltr. or kg) ; Glyphosate 41 SL = Rs.476 per litre Labour cost/day = Rs.60
Paraqat 24 SL = Rs.285 per litre Cost of cutting the*Chromolaena*- Rs.3000 ha^{-1}
Almix 20% WP = Rs. 140 for 8 gram
2,4D Na salt 80 WP = Rs.182 per kg