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Mortality of Siam Weed- *Chromolaena Odorata* (L.) R.M. King and H. Robinson

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Abstract: *The investigation was carried out separately on existing weed Chromolaena odorata and sprouts of de -topped Chromolaena odorata during 2013 at Gandhi Krishi Vigyan Kendra, University of Agricultural Sciences, Bangalore, to find out different concentration of herbicides with different time of spraying (August and November). On both existing and de –topped Chromolaena, application of glyphosate at 1.2 to 1.6 kg a.i. ha^{-1} and paraquat 0.4 to 1.0 kg a.i. ha^{-1} caused complete drying by 40th and 10th day after spraying, respectively. There was no re-growth till 90 day after spraying in these two treatments. Similarly, application of Chlorimuron ethyl 10WP + metsulfuron methyl 10 WP caused slight initial sprouting up to 40th day and subsequently no growth was observed at all concentrations in old plants. Where, as in de –topped plants per cent of drying increase at 40th day after spraying, by 90th day after spraying mortality rose to 25 to 54%. However, 2, 4-D Na salt at 1.0 to 2.5 kg/ ha spraying did not cause mortality up to 40th day after spraying and caused 7 to 9% and 14 to 23% mortality respectively of Chromolaena with existing and de –topped plants. Further, there was re –sprouting to an extent of 5 to 13% by 90th day in both existing and de –topped weed plants.*

Keywords: *Chromolaena odorata, Mortality, Paraquat, Glyphosate, 2, 4-D Na salt*

I. Introduction

Chromolaena odorata (L.) R.M. King and H. Robinson (Asteraceae) commonly known as Communist weed /Siam weed is a native of South and Central America. In India, it is variously known as *gandhi gulabi, communist pacha, sam- solokh, tongal-lati, sam-rhabi* while in other Asian countries it is called as Siam weed, The weed poses a grate threat to the fragile biodiversity of the Western Ghats, where it is competitively replacing the existing indigenous rich flora, thereby creating ecological imbalance (Ramachandra Prasad *et al*., 2003). Hand pulling, digging with spade and slashing with sickle are the common practices for controlling the weed. However these mechanical methods give only short term control (Muniappan and Marutani, 1996). Though biological methods are being tried, they do not give immediate results. Hence chemical methods are attempted as an alternative to the costly and labour intensive mechanical methods. Common post – emergence herbicides 2, 4 –D, paraquat and glyphosate have been found to be effective in controlling *Chromolaena odorata* Madrid (1974), Borthakur (1977) and Vernier *et al*. (1995) reported the efficiency of 2, 4 –D against this weed. Leucas (1989) have found that glyphosate was effective against *Chromolaena*, similar indication was also observed in earlier study at southern Karnataka (Anon, 2008).

II. Materials and Methods

The experiment was laid out with 18 treatments in a Randomised complete block design with three replications involving four herbicides with four concentrations viz., glyphosate 41 SL 0.4, 0.8, 1.2 and 1.6 kg a.i./ ha, paraquat 24 SL 0.4, 0.6, 0.8 and 1.0 kg a.i./ ha, chlorimuron ethyl 10WP + metsulfuron methyl 10 WP (Almix 20WP) 2.0, 3.0, 4.0 and 5.0 g /ha, 2, 4-D Na salt 80 WP 1.0, 1.5, 2.0 and 2.5 kg a.i. /ha. Each herbicide were sprayed separately with different concentrations using a hand operated knapsack sprayer fitted with flood jet nozzle WFN 72 on naturally grown *Chromolaena odorata* (4 ½ months old existing plants) during August -2003 and the same set of experiment was also laid out on sprouted *Chromolaena* (2 months old, de -topped old plants of *Chromolaena*) sprayed during November -2013, by using a spray volume of 500 litres per ha. The herbicides were sprayed uniformly covering all areas of the plots and the control treatment was sprayed with water. The efficiency of the each treatment was compared by noting the percentage of plants dried at every 10 days interval.

III. Results and Discussion

In both existing old plants as well as de –topped (sprouted plants), paraquat @ 0.40 to 1.0 kg ha^{-1} caused 100% drying of plants dried by 10th day after spraying, while there was no re -growth up to 90th day after spraying. Glyphosate @ 0.4 to 1.6 kg a.i. ha^{-1} caused leaf blotching and yellowing of leaves initially up to 40th day after spraying and there was 100% mortality by 40th day after spraying. No re -growth observed till 90th day after spraying in glyphosate treated *Chromolaena.* Between these two non selective herbicides, paraquat was

faster than glyphosate in causing early desiccation and mortality of *Chromolaena* (Table 1), as also observed by early study at Bangalore (Anon, 2008) and Dharawad (Doddamani, 1992). However, manually cutting of *Chromolaena* caused sprouting from 15th day onwards and it was 49% and 44% by 60 days after cutting in old and de –topped plants respectively. This clearly suggested that manual cutting will not help in controlling *Chromolaena.* As observed in this study, *Chromolaena odorata* regeneration also occurred by sprouting of leaves from the plants subjected to partial drying as observed in earlier studies (Tehoume, 1980 and Singh *et al*., 1992).

In existing old plants, application of chlorimuron ethyl 10WP + metsulfuron methyl 10 WP at 2 to 5 g ha^{-1} caused leaf scorching and hyponasty symptoms on 15th day onwards. Subsequently, slow drying of plants increased from 30 days to completed drying by 60th day after spraying at all concentrations. However, in de –topped plants application of chlorimuron ethyl 10WP + metsulfuron methyl 10 WP at 2 to 5 g/ ha caused leaf browning, yellowing and epinasty symptoms specially at 5 g ha^{-1} on 15th day onwards. Subsequently, slow drying of plants increased from 30th day and it was able to cause 25 to 54% drying at 90th day after spraying at all concentrations unlike observed in glyphosate and paraquat causing 100% mortality in the present study and also observed by Mummigatti (1994) and earlier study at southern Karnataka (Anon, 2008). Further, chlorimuron ethyl 10WP + metsulfuron methyl 10 WP spray caused epinasty in some plants and 25% showed green leaves indicating recovery of dried portion of leaves particularly at high dosage. 2, 4-D Na salt application caused only scorching of leaves at all concentrations and there was no symptoms of drying of plants by 21st day after spraying here and there. By 90th day after spraying, hardly 16 to 23% in de –topped plants and 7 to 10% drying in existing old plants, indicating its non –effectiveness in controlling *Chromolaena*, as observed earlier by Mogali *et al.* (1989), Doddamani (1992), Abraham *et al*. (2008) and early studies at Bangalore (Anon, 2008) (Table 1).

The present results are in agreement with the findings of Mummigatti (1994) and Doddamani *et al*. (2001) who revealed similar results with the application of glyphosate which 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 Kushwaha *et al*. (1981) indicated that drying of *Chromolaena odorata* was found to be more in older plants (10 years and above) than the younger plants (<5 years). Tehoume (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. The present results are in agreement with the findings of Ivens (1974) who observed that picloram at 0.4 kg + 2, 4-D amine at 1.6 kg ha^{-1} caused no re-sprouting till 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. It was also pointed out that glyphosate is environmentally safe with no mammalian toxicity as compared to 2, 4-D, as observed by Mogali *et al*. (1989) confirming the present study.

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Table 1. Influence of herbicides on per cent 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.

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	Paraquat 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	Paraquat 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	Paraquat 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	Paraquat 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 WP4.0 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,
DASp/DAS = Days after spraying