Indian Journal of Weed Science 40 (1&2) : 79-81, 2008

Evaluation of herbicides for control of Parthenium in waste land

C.B. Gaikwad, M.C. Kasture and B.M. Lambade
Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra)
Email : cbgaikwad@indiatimes.com

ABSTRACT

The effect of different herbicides *viz.* glyphosate (0.5 and 0.75%), metribuzin (0.25 and 0.50%), metsulfuron-methyl (0.005 and 0.01%), 2,4-D EE (0.2 and 0.3%), atrazine (0.2 and 0.3%) was evaluated along with manual weeding (uprooting and cutting), NaCl 20% spray and unsprayed control in waste land at Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (M.H.) for two successive years during *rabi* 2004-05 and 2005-06. Results indicated that application of metribuzin and 2,4-D EE (0.2 and 0.3%) was found more effective for controlling Parthenium at 15 days after spraying. However, spraying of glyphosate (0.50 and 0.75%), atrazine (0.2 and 0.3%), 2,4-D EE and metribuzin recorded significantly lowest weed density and dry matter production and increased weed control efficiency at 30 days after spraying.

Key words : Herbicides, Parthenium, WCE, Weed dry matterWeed intensity.

Parthenium hysterophorus L. popularly known as congress grass, white top or carrot weed is one of the 10 most dangerous weeds of the world. Its ability to grow in diverse ecological conditions and absence of seed dormancy due to plasticity in physiological behavior has resulted in wide spread infestation in grass lands/waste lands / non-cropped areas as well as cultivated fields during all the seasons (Arya and Singh 1996). Further, its aggressiveness is also due to strong allelochemicals, which adversely affect the physiology of other plants growing in vicinity (Rice 1984). Initially, Parthenium was a weed of road sides, waste lands and other non-cropped areas, but now it has virtually entered field crops, orchards, residential and industrial premises. It is estimated that Parthenium has spread in 35 million hectare in India (Sushilkumar and Varshney 2007). Being health hazardous to human beings and animals, its manual uprooting and cutting is risky, tedious, impractical and often not economical (Paradkar *et al.* 1997). The herbicidal control, therefore, remains the only viable option for the control of Parthenium in the problematic areas (Tripathi *et al.* 1991). In view of this, the present investigation was conducted to evaluate the efficacy of different herbicides for controlling Parthenium in waste lands.

MATERIALS AND METHODS

The experiment was conducted during *rabi* 2004-05 and 2005-06 at Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra) to find out the effect of different herbicides on control of *Parthenium* in waste lands. The experiment was laid out in randomized block design in three replications with fourteen treatments including glyphosate 41 SL (0.5 and 0.75%), metribuzin 70 WP (0.25 and 0.50%), metsulfuron methyl 20 WP (0.005 and 0.01%), 2,4-D EE38 EC (0.2 and 0.3%), atrazine 50 WP (0.2 and 0.3%), manual weeding (uprooting and cutting), NaCl (20%) spray along with unsprayed control. *Parthenium* plants were allowed to grow and irrigated as and when required. All the herbicides were sprayed with Knapsack sprayer fitted with flat fan nozzle using 500 litre of water/ha at two stages, one at seedling stage (Parthenium of 2 to 3 weeks old) and another at pre-flowering stage (after 7-8 weeks of emergence). Weed intensity and weed dry matter production was recorded as per the stage of observation and weed control efficiency (WCE) was calculated with the following formula.

$$\text{WCE (\%)} = \frac{\text{Weed dry matter production in treated plot}}{\text{Weed dry matter production in control plot}} \text{ X } 100$$

RESULTS AND DISCUSSION

Weed density

Application of 2,4-D EE (0.2%) and metribuzin (0.25 and 0.50%) were found at par with each other at 15 days after spraying (DAS) and caused complete kill of Parthenium population and also did not allow any emergence of weed throughout its life cycle during *rabi* season of both the years of experimentation (Table 1). However, at 30 days of spraying, application of glyphosate and atrazine were found effective in addition to 2,4-D EE and metribuzin and gave significantly lower weed intensity than absolute control and manual weeding. Balyan *et al.* (1997) also reported the reduction in weed intensity of Parthenium due to use of glyphosate, 2,4-D and metribuzin.

Table 1 . Effect of herbicides on Parthenium weed density.

Treatments	Weed density(no./m^2)					
	Before spraying		15 DAS		30 DAS	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
Glyphosate 41 SL 0.50 %	281	218	193.0	182.0	-	-
Glyphosate 41 SL 0.75 %	260	253	172.0	166.0	-	-
Metribuzin 70 WP 0.25 %	252	171	--	--	-	-
Metribuzin 70 WP 0.50 %	267	244	--	--	-	-
Metsulfuron methyl 20 WP 0.005 %	290	332	215.0	245.0	117.4	171.0
Metsulfuron methyl 20 WP 0.01 %	271	290	187.0	218.0.	103.5	166.0
2,4-D EE 38 EC 0.2 %	288	255	--	--	-	-
2,4-D EE 38 EC 0.3 %	267	160	--	--	-	-
Atrazine 50 WP 0.2 %	275	249	120.0	108.0	-	-
Atrazine 50 WP 0.3 %	277	251	112.0	97.0	-	-
Manual weeding by uprooting	261	222	12.0	7.0	15.4	9.4
Manual weeding by cutting	273	226	18.0	20.0	13.0	15.0
NaCl 20 % spray	261	259	161.0	163.0	175.0	174.0
Unsprayed control	255	264	273.0	281.0	268.0	273
LSD (P=0.05)	52	65	10.4	11.5	11	7

DAS : Days after spraying.

Table 2 . Effect of herbicides on Parthenium weed biomass

Treatments	Weed biomass (g/m^2)					
	Before spraying		At 15 DAS		At 30 DAS	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
Glyphosate 41 SL 0.50 %	89.0	86.0	49.55(29.35)	47.43 (35.2)	--(100.0)	--(100.0)
Glyphosate 41 SL 0.75 %	68.0	62.0	31.43(36.9)	43.10 (28.8)	--(100.0)	--(100.0)
Metribuzin 70 WP 0.25 %	69.0	71.0	--(100.0)	--(100.0)	--(100.0)	--(100.0)
Metribuzin 70 WP 0.50 %	85.0	80.0	--(100.0)	--(100.0)	--(100.0)	--(100.0)
Metsulfuron methyl 20 WP 0.005 %	81.0	87.0	50.13(21.3)	57.17 (12.8)	20.16 (56.2)	23.30 (56.2)
Metsulfuron methyl 20 WP 0.01 %	52.0	55.0	35.18(31.4)	39.00 (22.5)	15.16 (61.4)	17.10 (39.2)
2,4-D. EE 38 EC 0.2 %	25.0	21.0	--(100.0)	--(100.0)	--(100.0)	--(100.0)
2,4-D. EE 38 EC 0.3 %	28.0	24.0	--(100.0)	--(100.0)	--(100.0)	--(100.0)
Atrazine 50 WP 0.2 %	28.0	23.0	16.35(55.9)	17.78 (61.5)	--(100.0)	--(100.0)
Atrazine 50 WP 0.3 %	25.0	21.5	14.71(58.8)	13.20 (65.6)	--(100.0)	--(100.0)
Manual weeding by uprooting	113.0	109.0	25.35(58.8)	24.58 (97.4)	30.15 (94.2)	28.13 (96.1)
Manual weeding by cutting	90.0	78.4	18.7(95.6)	12.33 (92.9)	40.75 (95.1)	37.33 (94.5)
NaCl 20 % spray	88.0	89.0	45.00(93.3)	47.60 (42.1)	60.13 (34.8)	59.77 (36.1)
Unsprayed control	83.0	87.0	124.41(40.9)	127.37 (-)	158.11 (-)	162.00 (-)
LSD (P=0.05)	12.52	11.64	6.50(8.5)	5.32 (9.6)	3.36 (2.9)	2.92 (2.92)

DAS : Days after spraying

Figures in parentheses denote weed control efficiency.

Weed control efficiency

Among the various herbicides tried at 15 days of spraying, 2, 4-D EE (0.2 and 0.3%) and metribuzin (0.25 and 0.50%) recorded 100% weed control efficiency. Total eradication of *Parthenium* was achieved with the application of glyphosate (0.50 and 0.75%), atrazine (0.2 and 0.3%), 2,4-D (0.2 and 0.3%) and metribuzin (0.25 and 0.50%) at 30 days after spraying. *Parthenium* was immediately killed after spraying of 20% NaCl, but its effect was nullified in advanced stage during both the years. These results are in conformity with those reported by Arya and Singh (1996), Brar and Walia (1991) and Bhan and Dixit (1997). The use of metribuzin (0.25 and 0.50 %) and 2,4-D EE (0.2 and 0.3 %) could be used for quick and effective control of *P. hysterophorus* on waste lands.

Dry matter production

Data for two years mean on dry matter production of *Parthenium* as influenced by various herbicides at different stages revealed that at 15 days after spraying, application of 2,4-D EE (0.2 and 0.3 %) and metribuzin (0.25 and 0.50 %) was found at par with each other and controlled the Parthenium infestation. However, at 30 days of spraying, application of glyphosate, atrazine, 2,4-D EE and metribuzin was found at par and gave significantly no dry matter production as compared to absolute control, manual weeding by uprooting and cutting and NaCl 20 % spray (Table 2). The results were corroborative with those reported by Mishra and Bhan (1995) and Sharma (2003).

ACKNOWLEDGEMENT

The authors are thankful to the Director, National Research Centre for Weed Science, Jabalpur and Department of Biotechnology, Government of India, New Delhi for providing financial support for conducting the trial.

REFERENCES

Arya MPS and Singh RV. 1996. Effect of varying levels of herbicides against *Parthenium hysterophorus* L. and other associated weeds. *Indian Journal of Weed Science* **28** (1 & 2) : 36-39.

Balyan RS, Yadav A and Malik RK. 1997. Easy and efficient control of carrot weed (*Parthenium hysterophorus* L.), Choudhary Charan Singh Hissar Agricultural University, *Extension Bulletin* : 8p.

Bhan VM and Dixit A. 1997. Herbicidal control of Parthenium *hysterophorus*. In : *First International Conference on Parthenium Management*, Dharwad (Karnataka), 6-8 October-1997, Mahadevappa M and Patil VC (eds.), Volume II. pp. 99-100.

Brar LS and Walia US. 1991. Herbicidal control of congress grass (*Parthenium hysterophorus* L.). *Indian Journal of Weed Science* **23** : 36-39.

Mishra JS and Bhan VM. 1995. Efficacy of sulfonylurea herbicides against *Parthenium hysterophorus* L. *Indian Journal of Weed Science* **27** (1 & 2) : 45-48

Paradkar NK, Kurchunia SP and Tiwari JP. 1997. Chemical control of *Parthenium hysterophorus* L. and other associated weeds in upland drilled rice. *Indian Journal of Weed Science* **29** : 151-154.

Sharma Rajvir. 2003. Prformance of different herbicides for control of congress grass (*Parthenium hysterophorus* L.) in non-cropped area. *Indian Journal of Weed Science* **35** (3 & 4) : 242-245.

Sushilkumar and Varshney JG. 2007. *Gajar ghas ka jaivik niyantrana: Vartman stithi and sambhvnayen* [Biological control of Parthenium: present status and prospects]. National Research Centre for Weed Science, Jabalpur: 110 pp.

Tripathi B, Baria A and Singh CM. 1991. Carrot weed, *Parthenium hysteriphorus* (L.)-Overview of the problem and strategy for its control. In : *Allelopathy* Rice EL. (ed),Second edn. Academic Press, New York.