Madras Agric. J., 100 (1-3): 143-145, March 2013
https://doi.org/10.29321/MAJ.10.001258

Short Note

Herbicide Management of Parthenium (*Parthenium hysterophorus* L.) in Non Crops Land and its Impact on Soil Micro-flora

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Field experiment was conducted in Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal during the *Kharif* seasons of 2009 and 2010 with an objective of location specific eco-safe herbicide management of Parthenium and microbial activity in soil. The experiment was laid out in randomized block design where each treatment was replicated seven times. The Chemical management was done by using Glyphosate 71 SG + 2, 4- D ammonium salt ready mixture @ 3 kg ha^{-1}; Glyphosate 71 SG @ 3 kg ha^{-1} and control. The highest Parthenium reduction was as against the treatment T_1 (Glyphosate 71 SG + 2, 4-D ready mixture 3 kg ha^{-1}) followed by T_2 (Glyphosate 71 SG @ 3 kg ha^{-1}). The maximum total bacteria (90.40), fungi (90.74) and actinobacteria (68.07) was recorded under T_1 (Glyphosate+2, 4-D ready mixture 3 kg ha^{-1}) followed by T_2 (Glyphosate 71 SG @ 3 kg ha^{-1}) . Thus application of these herbicides were safe and may be used to manage this invasive weed plant in non-crop land.

Key words: Parthenium, Glyphosate + 2, 4-D ready mixture, Glyphosate, micro flora.

Parthenium (*Parthenium hysterophorus* L.) popularly known as carrot grass, tara grass, congress grass or sada tupi has emerged as one of the worst weeds in India due to its harmful effects on crop plants, animals and man. The success of this weed may be attributed to its ability to produce large number of very light seeds per plants and these are dispersed through wind, water or various human activities; to germinate throughout the year; to regenerate from cut or broken parts; to withstand adverse climatic conditions. The chemical glyphosate 71 SG with various combinations has been using since ten years to manage Parthenium in the Kalyani municipality and also road surrounding areas along with cutting (Ghosh, 2010) management of Parthenium through manual cutting or application of herbicides is successful but as chemicals showed only temporary effect on this weed population necessitating repeated applications and these affect the bio- diversity and also the soil health. The occurrence of herbicide residues in soils and the effects of herbicides on soil environment are reviewed by Kulshrestha and Singh (1994).

Materials and Methods

Field experiment was conducted in Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal during the *Kharif* seasons of 2009 and 2010. The experiment was laid out in randomized block design where each treatment was replicated seven times. The Chemical management was done by using Glyphosate 71 SG + 2,4 - D ammonium salt ready mixture @ 3 kg ha^{-1} and Glyphosate 71 SG @ 3 kg ha^{-1} weedy check treatment. The Parthenium seeds were dried in shade for 5 days and kept for sowing in the open place. 5 m × 6 m area in the Farm ('C' Block Farm, Kalyani) road side was cleared at initial by spading. Ten kg weed seed free soil and sand mixture (1: 1 ratio) was placed in the surface of each 7 blocks of 1m × 5m area demarcated for observation recording. Hundred dried matured Parthenium seeds were sown on 6th September 2009 and 2010 in each experimental block.

Results and Discussion

Effect of herbicides on the Parthenium density, dry weight (g m^{-2}) and weed control efficiency (%)

It is evident that among 15 and 30 days after application (DAA), the highest reduction was (76.05% and 78.5% during 2009 and 2010, respectively) at 15 DAA and the corresponding figures at 30 DAA were 80.05 and 80.00 respectively as against the treatment T_1 (Glyphosate 71 SG + 2, 4-D ready mixture 3 kg ha^{-1}) followed by T_2 (Glyphosate 71 SG @ 3 kg ha^{-1}). All the treatments significantly lowered the dry weight over weedy check plot (T_3). Data also showed that at 15 and 30 DAA, the higher levels of weed control efficiency (41.16 and 66.72 %, respectively) was offered by the treatments T_1 (Glyphosate 71 SG + 2, 4-D ready mixture 3 kg ha^{-1})

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followed by T_2 (Glyphosate 71 SG @ 3 kg ha $^{-1}$) 38.19% at 15 DAA and 65.24 % at 30 DAA compared to control plot (T_3) (Table 1). The pooled mean data presented in table indicated that all the herbicidal treatment reduced the Parthenium population over the untreated control. The treatments Glyphosate 71 SG + 2, 4-D ready mixture 3 kg ha $^{-1}$ and Glyphosate 71 SG @ 3 kg ha^{-1} were found at par in

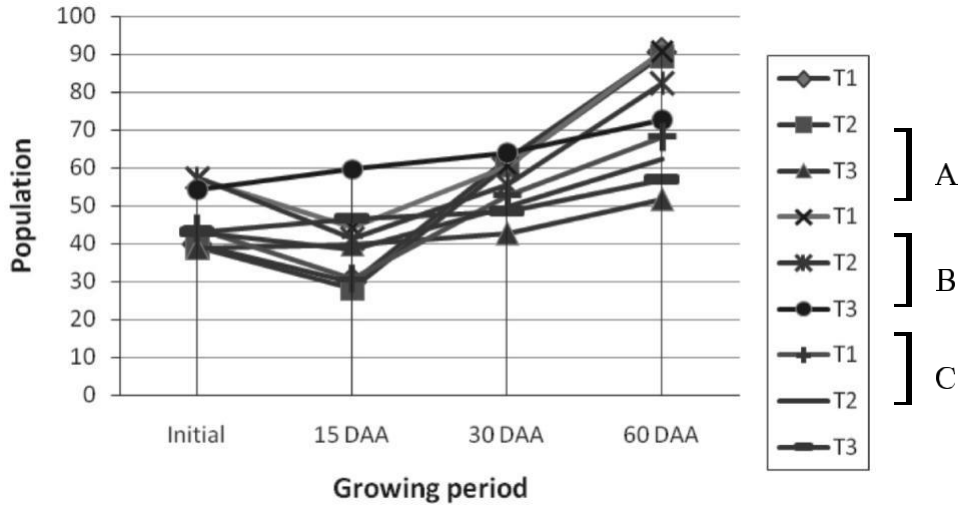
Table 1. Effect of herbicides on *Parthenium* plant reduction, dry weight and weed control efficiency (WCE %)

Treatment	% reduction in weed population				Mean Dry weight (g m^{-2})		WCE (%)	
	2009		2010				15 DAA	30 DAA
	15 DAA	30 DAA	15 DAA	30 DAA	15 DAA	30 DAA		
T_1 Glyphosate + 2,4-D ready mixture @ 3 kg ha^{-1}	76.05	80.05	78.5	80.00	302.16	182.2	41.16	66.72
T_2 Glyphosate (71%SG) @ 3 kg ha^{-1}	75.5	78.07	74.07	77.25	317.43	190.34	38.19	65.24
T_3 untreated plot	-	-	-	-	513.54	547.54	0.00	0.00

their efficacy (Table 1). Bhowmick *et al.* (2005) revealed that ready mixture of glyphosate and 2, 4-D (combi SG @ 6 ml lit^{-1}) as post-emergence sprays more effectively control the Parthenium. The treatment of ready mixture proved least effective followed by Glyphosate 71 SG in reducing the population of Parthenium. Ghosh (2009) and Bairwa *et al.* (2010) also had similar observation.

Influence of herbicides on the population of total bacteria, fungi and actinobacteria

The soil micro flora data of 2009 and 2010, showing the effect of herbicides on the total bacteria, fungi and actinobacteria population as have been presented before spraying; population of total bacteria, fungi and actinobacteria did not differ significantly with the treatments. At 15, 30 and 60 DAA significant differences were recorded as regarding total bacteria, fungi and actinobacteria population (Fig. 1). Finally maximum total bacteria (90.40), fungi (90.74) and actinobacteria (68.07) was recorded under T_1 (Glyphosate+2, 4-D ready mixture 3 kg ha $^{-1}$) followed by T_2 (Glyphosate 71 SG @ 3 kg ha^{-1}) total bacteria (89.57), fungi (82.23) and actinobacteria (62.23) (Fig. 1). The data relating to the population of total bacteria, fungi and



A= Bacteria; B = Fungi; C = Actinobacteria; CFU= Colony Forming Unit; DAA= Days after application

Fig. 1. Effect of herbicides on the population of bacteria, fungi and actinobacteria (CFU×10$_4$ g^{-1}) in soil

actinobacteria showed that the herbicides could enter into soil and come in contact with the microorganisms after treatment. Microorganisms were initially affected but later able to degrade herbicides and utilize them as a source of biogenic elements for their own physiological processes (Radivojevic *et al.*, 1989). However, herbicides had toxic effects on microorganisms, reducing their abundance, activity and consequently, the diversity of their communities. Research showed that there was no universal pattern of herbicidal effect on soil microorganisms (Haney *et al.*, 2000). The toxic

effects of herbicides were normally most severe immediately after application, when their concentration in soil was highest. Later on, microorganisms took part in degradation process and herbicide concentration and its toxic effects were decreased. The occurrence of herbicide residues in the soils and their effects on the soil environment was noticed (Kulshrestha and Singh, 1994).

Conclusion

From the findings of this experiment, it may be concluded that the herbicide ready mixture could be used in non- cropped areas particularly in fallow, waste land or even in orchards to control Parthenium at its younger vegetative stage. In addition to this the population of soil micro-flora is increasing. Organic herbicides are best for controlling Parthenium as well as maintain good soil health.

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Received: August 22, 2012; Accepted: February 8, 2013