

Allelopathic interaction of *Lantana camara* leaf of extract on growth of *Parthenium hysterophorus* in seedling stage

■ ARPANA MISHRA

SUMMARY

The effect of leaf extract of *L.camara* was studied on the growth of *Parthenium hysterophorus* in seedling stage. Leaf extract showed pronounced inhibition of shoot length, root length, leaf area, fresh and dry weight of the test species. The inhibitory effect was strictly concentration dependant. Maximum inhibition in growth was observed in 100 per cent aqueous leaf extract.

Key Words : Allelopathy, Leaf extract, *Lantana camara*

How to cite this article : Mishra, Arpana (2012). Allelopathic interaction of *Lantana camara* leaf of extract on growth of *Parthenium hysterophorus* in seedling stage. *Internat. J. Plant Sci.*, 7 (2) : 259-262.

Article chronicle : Received : 25.01.2012; Revised : 19.04.2012; Accepted : 30.04.2012

Invasive species are recognized as one of the major threats to native species and ecosystems around the world (Kathiresan, 2004; Kathiresan *et al.*, 2005). Invasive species are of concern because of their capability of spreading fast, their high competitiveness and ability to colonize new areas within short periods. The nature and severity of the impacts of these species on society, economic life, health and national heritage are of global concern (McNeely *et al.*, 2001). *Parthenium hysterophorus* L. commonly called congress grass or carrot weed is one of the aggressive, obnoxious, (Oudhia, 2000) invasive weeds that has made wide distribution globally affecting the growth of native species (Bhan *et al.*, 1997). It is one of the worst weeds for agriculture, environment, human health and economy (Rupschus *et al.*, 2007; Wiesner *et al.*, 2007). Management of the obnoxious growth of some weed species through allelopathy has attracted considerable attention in recent years (Rice, 1984; Gopal and Goel, 1993).

Allelochemicals are present in plant roots, rhizomes, stems, leaves, flowers, inflorescence, pollen, fruits and seeds, but leaves are the major source of allelochemicals (Rice, 1984).

L. camara is notorious, noxious and invasive weed belonging to Verbenaceae family. *L. camara* has allelopathic

effect against agronomic crop such as *Brassica juncea*, *Raphanus sativus*, *Cucumis sativus* L., *Cicer arietinum* L., *Phaseolus mungo* etc. Allelochemicals of *L. camara* could be exploited for weed control. Allelochemicals of *L.camara* has potential in the development of new herbicides. Therefore, in the present study an attempt was made to know the effect of *L.camara* leaf extract on growth of *P.hysterophorus* in seedling stage.

MATERIALS AND METHODS

The study area Shakti nagar lies in the Banda district of Uttar Pradesh in between Latitude 24° 53' and 25° 55' N, Longitude 80° 07' and 81° 34' E, the geographical area of the district is 4114.20 sq. km. Leaves, stems and roots of *Lantana camara* were collected from Chitrakoot region of Madhya Pradesh. Collection of raw material and preparation of extract was done two days in advance for each spray. Plant parts were separated into leaves, stems and roots. Roots were carefully removed from soil.

The preparation process of aqueous extract was undertaken for *Lantana camara* different parts leaf, stem and root aqueous extract is as under. 100 g of each leaf, stem and root were chopped in small pieces and crushed in the mixture grinder. After grinding the material of leaf, stem and root paste were soaked in 200 ml of distilled water for 24 hrs then different concentrations *viz.*, 100 per cent, 50 per cent, 33 per cent, 25 per cent were prepared and water as a control treatment. The

AUTHOR TO BE CONTACTED

ARPANA MISHRA, Department of Botany, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, SATNA (M.P.) INDIA

Email: arpanamishra@gmail.com

extract of each specimen was filtered through muslin cloth .The concentration of each specimen was maintained by adding distilled water. In each of the experiments the size of the quadrate was 100 cm x 100 cm (1m²). Seedling of *Parthenium hysterophorus* were sprayed with different aqueous extracts of *Lantana camara* on alternate days but control quadrates were sprayed with distilled water .

Plants samples were analyzed for shoot and root length, leaf area, fresh and dry weight. Leaf area was measured with the help of a leaf area meter (Model No. 211 Systronice). Plants were dried in an oven at 80°C for 24 hour and weighed.

RESULTS AND DISCUSSION

Shoot and root length, leaf area and fresh and dry weight were inhibited significantly by the varied concentration of leaf aqueous extract of *Lantana camara*.

Effect of *Lantana camara* aqueous leaf extract on shoot and root length of *Parthenium hysterophorus* in seedling stage :

According to the result recorded in Table 1 the different concentration of aqueous leaf extract of *Lantana camara* had significant effect on shoot and root length of seedling of *Parthenium hysterophorus*. Plant shoot and root length decreased over control with the increasing concentration of extract. The plant growth was inhibited after aqueous leaf extract spray on *Parthenium hysterophorus*. Plant shoot and root length were controlled after 4th spray, 3rd spray, 2nd spray and 1st spray of 25 per cent, 33 per cent, 50 per cent and 100 per cent concentration of aqueous leaf extract of *Lantana camara*, respectively. Finally plants were dead after 5th, 4th, 3rd and 2nd

spray of 25 per cent, 33 per cent, 50 per cent and 100 per cent concentration of aqueous leaf extract of *Lantana camara*, respectively. Maximum increase in growth of shoot (850 %) and root (150%) was observed in control. In 25 per cent extract, there was increase 53.33 per cent in shoot and 17.64 per cent in root over control. Minimum increase of 6.66 per cent in shoot length and 3.12 per cent in root length was recorded in 50 per cent concentration, but in 100 per cent extract concentration, the plant growth was completely suppressed after single spray.

Effect of *Lantana camara* aqueous leaf extract on leaf area of *Parthenium hysterophorus* in seedling stage :

Observations recorded in Table 2 show that the different concentrations of aqueous leaf extract of *Lantana camara* had inhibitory effect on leaf area in seedling stage of *Parthenium hysterophorus*. Plant leaf area was decreased over control with the increasing concentration of extract. Maximum leaf area (185 %) of *Parthenium hysterophorus* was observed in control. The leaf area was decreased after aqueous leaf extract spray on plant. In 25 per cent concentration of aqueous leaf extract the leaf area was increased 43.47 per cent whese as in 33 per cent concentration increase was 17.18 per cent over control. Maximum was 7.40 per cent increase was recorded in 50 per cent concentration but in 100 per cent extract concentration, the leaf area was completely constant after first spray.

Effect of *Lantana camara* aqueous leaf extract on fresh and dry weight of *Parthenium hysterophorus* in seedling stage :

The different concentrations of aqueous leaf extract of

Table 1 : Effect of *Lantana camara* leaf extract on growth (cm) of *Parthenium hysterophorus* in seedling stage

Concentration in %	Plant growth (cm)	Shoot and root length (cm) at the time of spray							% Increase 18 days Over BT	% Decrease 18 days Over BT
		Number of spray at the alternate days					Total days (18)			
		1	2	3	4	5				
Control	Shoot	1.0	2.3	3.8	5.5	7.4	9.5	850		
	Root	6.0	7.4	9	10.8	12.8	15	150		
25 %	Shoot	1.5	2.0	2.2	2.3	2.3	-	53.33	796.67	
	Root	6.8	7.5	7.8	8.0	8.0	-	17.64	132.36	
33%	Shoot	1.2	1.5	1.6	1.6	-	-	33.33	816.67	
	Root	6.3	6.8	7.0	7.0	-	-	11.11	138.89	
50 %	Shoot	1.5	1.6	1.6	-	-	-	6.66	843.34	
	Root	6.4	6.6	6.6	-	-	-	3.12	146.88	
100 %	Shoot	1.4	1.4	-	-	-	-	0	0	
	Root	6.5	6.5	-	-	-	-	0	0	

BT = Before treatment; - = Dead the *Parthenium* weed

Lantana camara had allelopathic effect on fresh and dry weight of *Parthenium hysterophorus*. Plant fresh and dry weight was decreased over control with the increasing concentration of extract. Fresh and dry weight was decreased after aqueous leaf extract spray on plant.

Maximum increase (813.95%) in fresh weight of *Parthenium hysterophorus* was observed in control. In 25 per cent concentration of aqueous leaf extract, an increase of 12.39 per cent in fresh weight was observed while increase was 5.97 per cent in 33 per cent concentration over control.

The suppressive effect of *Lantana* on other weeds may be caused by allelopathy. The probable reason of inhibition may be the presence of allelochemicals. Many allelochemicals are present such as betulic acid, caffeic acid, vanillic acid, ferulic acid, p-hydroxybenzoic acid, lantadene A, lantadene B, camarinic acid etc found in *Lantana camara*. In *Lantana*

camara triterpenoides such as oleanic acid, oleanonic acid and ursonic acid were major constituents but lantadene A and lantadene B were present in significant amount (Sharma *et al.*, 1988). Many allelochemicals are phenolics, which are water soluble (Rice, 1984). The *L. camara* leaves contain allelochemicals like phenolic compounds, mono- and sesquiterpenes, triterpenes, triterpenoids, quinines, essential oils, flavonoids, biocides etc. (Raghavan, 1976).

The aqueous extracts of leaf, flower and fruit of *L. camara* have allelopathic effects on seedling growth and dry matter production of radish and lettuce (Qiaoying *et al.*, 2009). The *Lantana camara* aqueous extract induced the greatest inhibition in bean and tomato radical growth (Cruz-Ortega *et al.*, 2004). The aqueous leaves extracts of *Lantana camara* was phytotoxic to growth of rape, Chinese, cabbage, spinach and chili (Sahid and Sugau, 1993).

Table 2 : Effect of *Lantana camara* leaf extracts on leaf area (cm²) of *Parthenium hysterophorus* in seedling stage

Concentration in %	Leaf area (cm ²) at time of spray						Total Day 18)	% increase 18 days Over BT	% decrease 18 days Over BT
	Number of spray at the alternate days								
	1	2	3	4	5				
Control	6.0	7.9	10	12.3	14.8	17.1	185		
25%	4.6	5.5	6.2	6.6	6.6	-	43.47	141.53	
33%	6.4	7.1	7.5	7.5	-	-	17.18	167.82	
50%	5.4	5.8	5.8	-	-	-	7.40	177.6	
100 %	5.3	5.3	-	-	-	-	0	0	

BT = Before treatment; - = Dead *Parthenium* weed

Table 3 : Effect of *Lantana camara* leaf extract on whole plant fresh and dry weight (g/plant) of *Parthenium hysterophorus* in seedling stage

Concentration in %	fresh and dry weight (g/plant)	Whole plant fresh and dry weight (g/plant) at the time of spray						Total days (18)	% increase 18 days Over BT	% decrease 18 days Over BT
		Number of spray at the alternate days								
		1	2	3	4	5				
Control	FW	0.86	2.06	3.36	4.76	6.26	7.86	813.95		
	DW	0.110	0.263	0.430	0.60	0.80	1.00	•		
25 %	FW	0.92	0.975	1.014	1.034	1.034	-	12.39	801.56	
	DW	0.117	0.124	0.129	0.132	0.132	-	•	••	
33%	FW	0.82	0.852	0.869	0.869	-	-	5.97	807.98	
	DW	0.104	0.109	0.111	0.111	-	-	•	••	
50 %	FW	0.90	0.918	0.918	-	-	-	1.11	812.84	
	DW	0.115	0.117	0.117	-	-	-	•	••	
100 %	FW	0.88	0.88	-	-	-	-	0	0	
	DW	0.112	0.112	-	-	-	-	•	••	

FW = Fresh weight; DW= Dry weight; BT = Before treatment; - = Dead *Parthenium* weed; • = The percentage increases of dry weight were observed according fresh weight increase; •• = The percentage decreases of dry weight were observed according fresh weight decrease

REFERENCES

- Bhan, V.M., Kumar, S. and Raghuvamsi, M.S. (1997). Future strategies for effective *Parthenium* management, In: Proc. First. Int. Conf. on *Parthenium* Management. UAS, Bangalore, (KARNATAKA) INDIA. pp. 90-95.
- Cruz-Ortega, R., Romero-Romero, T., Ayala-Cordero, G. and Anaya, A.L. (2004). Proteomic techniques for the study of allelopathic stress produced by some Mexican plants on protein patterns of bean and tomato roots. CRC Press., pp 271-287.
- Gopal, B. and Goel, U. (1993). Competition and allelopathy in aquatic plant communities. *Bot. Rev.*, **59**: 156-210.
- Kathiresan, R. M. (2004). Invasive weeds in agro-ecosystems of South India [Abstracts]. In: National Workshop on Invasive Alien species and Biodiversity in India, Banaras Hindu University, Varanasi (U.P.) INDIA. pp.149.
- Kathiresan, R. M., Gnanavel, I., Anbhazhagan, R., Padmaria, S. P., Vijayalakshmi, N. K. and Arulchezhian, M. P. (2005). Ecology and control of *Parthenium* invasion in command area. In: Proceedings of Second International Conference on *Parthenium* Management 5-7 Dec 2005. Bangalore (KARNATAKA) INDIA. pp.77-80.
- McNeely, J. A., Mooney, A. H., Scheip, E.L. and Waage, K.J. (2001). A Global strategy on invasive Alien species, IUCN Gland Switzerland and Cambridge, UK, in collaboration with GISP., 50 pp.
- Oudhia, P. (2000). Medicinal herbs and insects of Chattisgarh India. *Insect Environment.*, **6**: 138-141.
- Qiaoying, Z., Shaolin, P. and Yunchun, Z. (2009). Allelopathic potential of reproductive organs of exotic weed *Lantana camara*. *Allelopathy J.*, **23** (1): Online ISSN : 0973-5046.
- Raghavan, V. (1976). In: *Recent advances in botany*. Kachroo, P.(Ed.): 264 pp. Bishan Singh and Mahendra Pal Singh, Dehradun (UTTARAKHAND) INDIA.
- Rupschus, C., Kirschke, D., Buettner, C., Ulrichs, C. and Tessema, T. (2007). Economic impacts of invasive weed species in developing countries: the Case of *Parthenium* in Ethiopia [Abstract]. International Research on Food Security, Natural Resource Management and Rural Development. October 9-11, 2007, Witzenhausen., 171pp.
- Rice, E.L. (1984). *Allelopathy*. (II Ed.). Academic Press, New York, 422pp.
- Sharma, O.P., Makkar, H.P.S. and Dawra, R.K. (1988). A review of the noxious plant *Lantana camara*. *Toxicon.*, **26**: 975-987.
- Sahid, B.I. and Sugau, B.J. (1993). Allelopathic effect of *Lantana camara* and Siam weed (*Chromolaena odorata*) on selected crops. *Weed Sci.*, **41**(2): 303-308.
- Wiesner, M., Tessema T., Hoffmann, A., Wilfried, P., Buettner, C., Mewis, I. and Ulrichs, C. (2007). Impact of the pan-tropical weed *Parthenium hysterophorus* L. on human health in Ethiopia. [Abstract]. International Research on Food Security, Natural Resource Management and Rural Development. October 9-11, 2007, Witzenhausen., 174pp.

