P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-2* ISSUE-10* January- 2018
E: ISSN NO.: 2455-0817 *Remarking An Analisation*

Screening of Allelopathic Potential of Exotic Terrestrial Plant Species Using *Ceratophyllum Muricatum Bioassay*

Anju Mittal
Assistant Professor,
Deptt.of Botany,
Govt. Girls College,
Chomu, Rajasthan

K. P Sharma
Professor,
Deptt.of Botany,
University of Rajasthan,
Jaipur, Rajasthan

Abstract

The allelopathic effect of aqueous shoot extract of *Parthenium hysterophorus* and *prosopis chilensis*, leaf extract of *Eucalyptus camaldulensis* were studied on the growth of the Submerged macrophytes *Ceratophyllum muricatum* in which all the extracts put along with tap water and a mixture of clay and garden soil in 1:2 ratio, were applied and as a result of this, *Eucalyptus* extract promoted *Ceratophyllum muricatum* growth throughout the study period. *Prosopis* has inhibitory effect on *Ceratophyllum muricatum* growth in the beginning. *Parthenium* extract was however inhibitory to *Ceratophyllum muricatum* growth throughout the study period.

Keywords: Eucalyptus, Prosopis, Parthenium, Ceratophyllum, Allelopathy.

Introduction

'Allelopathy' a term coined by an Austrian Scientist Molish (1937) involves chemical warfarebetween two plants species.

Review of Literature

Several studies of allelopathy in terrestrial ecosystem have shown that the plant litter intact or its leachates and extracts exert allelochemicals influence on other species (Rice, 1974; Silverstein and Simeone, 1983, Ahmed and Hoque 2008, Netsere and Mendsil 2011, Hozayan et.al. 2015)

Allelopathy may also provide a strategy for vegetation management in the aquatic ecosystem (Sczepenska1971). Unlike terrestrial plants allelochemical studies among aquatic plants are comparatively fenw (Whittaker, 1870; Whittaker & Feehey, 1971; Rice, 1984; Gopal and Goel, 1993).

Several studies have also demonstrated allelopathic potential of leaf leachates of several terrestrial plant species to no of aquatic plant species important among them are *Lantana camara (Saxena2000)*, Eucalyptus spp. *Prosopis juliflora*, *Parthenaniun* and *Casuarina*. Leaf Leachates of *Eucalyptius* species have also received considerable attention for their allelopathic properties and were found to inhibit growth of number of aquatic plant including duckweeds (Kohli et at 1987; May and Ash 1990; Singh and Kohli (1992).

Several studies showed that terrestrial plant species had both positive as well negative interactions with aquatic macrophytes. These finding are important as large amount of allochthonous organic matter (in the form of plant litter) of terrestrial origin enter into water bodies which may have significant effect on the aquatic vegetation (Singh Kohli 1992, Chaturvedi, 1996). In the present investigation, Allelopathic Potential of *Prosopis chilensis*, *Eucalyptus camaldulensis*, *Parthenium hysterophorus* terrestrial plant examined on *Ceratophyllum muricatum* bioassay.

The ecological benefits of allelopathic behavior are evident as they provide the plants with great competitive advantages with a limited investment in toxic chemicals that are harmless to the plant itself.

Aim of the Study

The main purpose of research on allelopathic effect of terrestrial allochthonous matter on aquatic macrophytes is to evaluate its effects on aquatic macrophytes in water management.

Materials and Methods

Ceratophyllum muricatum growing in mono-specific stand in the concrete tanks of the botanical garden was the source of the plant material in this study.

Allelopathic potential of *Prosopis chilensis, Eucalyptus camaldulensis Parthenium hysterophorous* were determined in forty, 7.

L sized earthen pots, each containing about 1 Kg of soil, a mixture of clay and garden soil in 1:2 ratio

Shoots of both *Parthenium* and *Prosopis* while only the leaves of *Eucalyptus* were collected from the plants growing in the University campus30 g (fresh weight) of plant material of either species was filled in separately in a cotton bag. One bag was submerged in 3L tap water filled in a 7L sized earthen pot to make 1% concentration of the leachates. The bag was retained at the pot bottom by a stone. The control pots were having only the tap water. Only 10 pots were used for a given plant species. 10 pots without any plant material served as control.

Ceratophyllum muricaturn growing in concrete tanks was washed in the tap water to free debris. The excess water was soaked in the blotting paper. 4 g (f.wt) of *C.muricatum* plants was added in each earthen pots. All pots were placed in the botanical garden where sunlight stayed for 4 hours only. Two harvests were made after 15 and 30 days of plant growth. At each harvest, plants were dried to a constant weight separately in a hot air oven at 80°C.

Results

Ceratophyllum Growth In Eucalyptus Leaf Extract

Leaf extract was reddish brown in colour and had aroma of Eucalyptus leaf. Growth of *Ceratophyllum* was better in the leaf extract compared with the control plants. Percentage increase in dry weight of plants growing in extract was about 50% higher than control plants in the first harvest (see table and Fig). After first harvest *Ceratophyllum* growth in the extract was again higher than control plant. Percentage increase in dry weight in control plant in second harvest was about 40% when compared with first harvest. Increase in dry weight of plant growing in the extract was however higher, about 50% in the secondharvest in comparison to first harvest, indicating better growth of *Ceratophyllum*in the extract.

The comparison of *Ceratophyllum* growth in extract with control plant during second harvest revealed about 60% increase in dry weight of plant in the extracts, thus positive effect of *Eucalyptus* extract continued after first harvest and was rather more in comparison to the first harvest.

Ceratophyllum Growth in Prosopis Chilens1s Extract

The leafy shoot extract was dark brown colored with offensive smell. *Ceratophyllum* growth was adversely affected in leachates in the beginning, butwas better than control plant after first harvest. Dry weight of *Ceratophyllum* in the extract was about 10% less than control plants during 1st harvest. The difference in the dry weight of plants growing in control and extract was insignificant at 5% probability after first harvest. *Ceratophyllum* growth occurred rapidly in the extract. Percentage increase in dry weight over 1st harvest was almost 150% at the time of 2nd harvest. The increase in dry weight in control plants during same period was about just 40%, suggesting marked stimulatory effect of extract after 10 days (see table and figure).

Dry weight of *Ceratophyllum* during second harvest was about 55% higher than that of control plants. Thus unlike *Eucalyptus* extract *Prosopis* extract was inhibitory in the beginning, but was promontory afterwards.

Ceratophyllum Growth in Parthenium Extracts

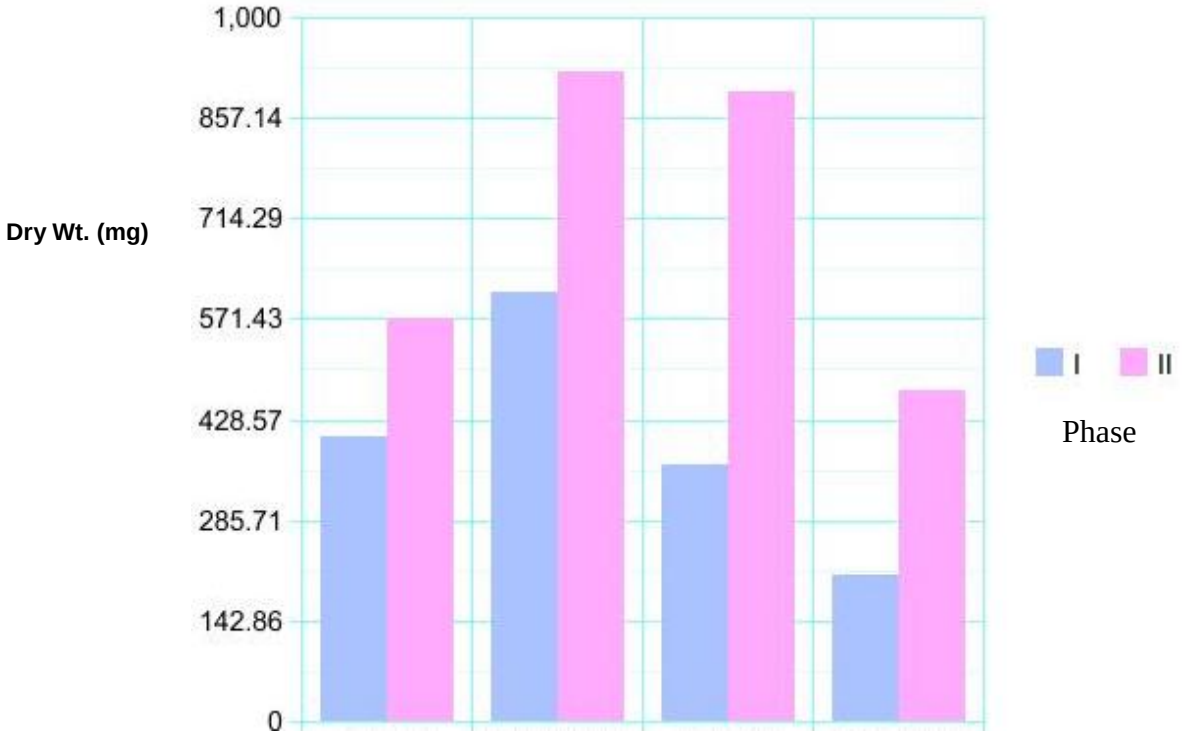
Parthenium extract was dark brown with offensive odour similar to *Prosopis* extract. Unlike *Eucalyptus* and *Prosopis extract*, growth in *Partherium* extract was adversely affected in comparison to control, plant during both harvests. Adverse effect on growth was more severe during 1st harvest. Asa result dry weight of *Ceratophyllum*in the extract was about 50% of the dry weight of control plants. The severity of the extract decreased after 1st harvest. As a result dry weight of *Ceratophyllum* increased more than two folds of the first harvest at second harvest. Percentage increase in control sets during the same period was however, only 40%. This indicates that *Parthenium* extract was inhibitory to *Ceratophyllum* growth in the beginning and had a significant effect after 10 days. Therefore, dry weight of *Ceratophyllum* in extract during 2ndharvest was only 15% less than control plant (see table and figure).

Table: Mean Fry Weights (mg) of C. *Muricatum* Plants in 1% Aqueous Extracts of Different Plant Species

Plant Species	Ist Harvest (10 days)	II harvest (20 days)
Control	400 ± 75.6	571.5 ± 142.5
	(± 37.8)	(± 71)
Eucalyptus- camaldulensis	608.9 ± 126.5*	922.3 ± 43**
	(± 63)	(± 21)
Prosopis- hysterophorus	366 ± 98 NS	896.4 ± 111*
	(± 49)	(± 55)
Parthenium- chilensis	207 ± 94*	471± 88 NS
	(± 47)	(± 44)

Data in Parenthesis are standard error.
± SD Non-significant.
** Significant at 1% probability.
* Significant at 5% probability.

Growth of *C Muricatum* in 1% Aqueous Extracts of Terrestrial Plantspecies



Discussion

C. muricatum were used in bioassay of *Eucalyptus, Prosopis* and *Parthenium* extract. Dry weight of with C. *muricatum*in *Eucalyptus* extract were higher (52-60%) than control plants during both harvest (table) though it adversely affected *Lemna* growth (Singh and Kohil 1992 and Chaturvedi and Sharma 1997). *Ceratophyllun* dry weight were little lower (10%) during first harvest in *Prosopis* extract but higher that control plants (57%) during 2nd harvest. *Lemna* growth was however, inhibited during the study period in its extract (Chaturvedi and Sharma 1997) *Ceratophyllum* dry weight in the*Partheniu*mextract were less during both first 93%) as well as in second harvest (21% Similar to *Eichhornia* and *Pistia*(Pandey et al, 1993, Pandey 1994). It is thus evident that allelopathic effect varied with the test species perhaps on account of difference in their tolerance to allelochemicals.

Conclusion

Thus *Eucalypatus* extract had promoter effect on *Ceratophyllum* growth from the beginning. *Prosopis* extract having inhibitory effect on *Ceratophyllum* growth in the beginning however promoted afterwards. *Parthenium* extract was inhibitory to *Ceratophyllum* growth throughout study. It was observed that allelopathic effect was found to be declining as time lapsed. Allelopathic effect of *Parthenium hysterophorus* on terrestrial species has been observed many times (Wakjira et.al. 2009, Shehzad et.al 2016) but its effects have not been evaluated for aquatic species. The study indicates inhibitory effect of the allelochemicals was short lived perhaps on account of their decay.

Acknowledgements

Authors are grateful to the Head, Department of Botany, Rajasthan University for providing the necessary facilities.

References

1. *Ahmed, R., Hoque, R. A.T.H., 2008 Allelopathic effect of leaf litter of Eucalyptus camaldulensis on some forest and agriculture crop. Journal of Forestry Research March 2000 Volume 19 issue 1 pp - 19-24*
2. *Chaturvedi,N. 1996 Competition and Allelopathic Interactions among Aquatic*
3. *Macrophytes Ph.d. Thesis, University of Rajasthan, Jaipur.*
4. *Chaturvedi, N. and K.P.Sharma 1997kScreening of allelopathic potential of some terrestrial and wetland plant species. Journal of Environ & Pollution 4 (3) P. P.229.236.*
5. *Gopal,Band Usha Goel. 1993. Competition and allelopathy in aquatic plant communities. The Botanical Review.59 (3) :155-210.*
6. *Kohli,R.K., K.Kaur, P.Chaudhry, A.Kumariand D.B.Saxena.1987. Negative aspects of Eucalyptus farming. pp. 225-233. In:P.K.Khosla and D.K.Khurana (eds.) Agroforestry for Rural Needs. Indian Society of Tree Scientists, Solan, India.*
7. *Hozayan M., E.I Shahway T.A., Abd, Elmohem A.A., El. Saddy A.A. and Darvish M.A 2015. Allelopathic of Casuarina equisetefolia on wheat, associated weed and nutrient content in the soil. African Journal of Agricultural research. Academic Journal of org. vol.10(14) p.1675-1683.*

8. *May, F.E. Ash. 1990. An assessment of the allelopathic potential of Eucalyptus. Austral. J. Bot. 38: 245-254.*
9. *Molisch, H. 1937. Der Einflusseinerpflanze auf die andere-Allelopathie G. Fischer Verlag, Jena.*
10. *Netsere, A., Mendesil, E., (2011) Allelopathic effect of Parthenium hysterophorus L. aqueous extract on Soybean Glycine max L.) and haricot bean (Phaseolus vulgarisL.) Seed germination shoot and root growth and dry matter Production. Journal of applied Botany and food quality 84, 219-222.*
11. *Pandey, D.K. 1994. Inhibition of PistiaStrationtesL by Parthenium (parthenium hystophorus) National Symposium on Agricultural Environment Abstract pp.94.*
12. *Rice, E.L. 1984. Allelopathy. 2nd Edition. Academic Press, N.Y.*
13. *Saxena, M.K. 2000Aqucous leachate of Lantana camarakills water hyacinth, J. Chem Eco. 26 : 2435-2447.*
14. *Singh,D. and R.K.Kohli1992. Reasons of poor under floor vegetation of Eucalyptus. pp. 114-117.In:P.Tauro and S.S.Narwal (eds.) Proc. First Nat.Symp. Allelopathy in Agroecosystems. Indian Society of Allelopathy, Haryana Agri. Univ.Hissar, India.*
15. *Shehzad M., Hussain S., Mubeen K., Shoaib M. 2016. Alleopathic effect of Parthenium hysterophorous mulch growth and yield of soybean(glycine max) Planta Daninha, SciELO Brasil.*
16. *Szczepanska, W. 1971. Allelopathy among the aquatic plants. PolskieArchiwumHydrobiologii 18.: 17-30.*
17. *Whittaker, R.H 1970. The biochemical ecology of higher plants In: Chemical Ecology. E Sondheimer and J.B.Simeone (eds.) Academic Press, New York, pp 43-70.*
18. *Whittaker, R.H. and P.P.Feeny 1971. Allelochemics: Chemical interactions between species Science 171:757-770.*
19. *Wakjira, Berecha G., Tulu S. 2009. Allelopathic effect of invasive alien weed Parthenium hysterophorous L. compost on lettuce germination and growth. African Journal of Agriculture, Academic Journal org.Vol 4(11) pp 1325-1330*