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ALLELOPATHIC EFFECTS OF *Centella asiatica* AQUEOUS EXTRACTS ON PEARL MILLET (*Pennisetum typhoides* L.) AND COWPEA (*Vigna unguiculata* WALP.)

C. Alagesaboopathi[1]

ABSTRACT

The allelopathic effects of aqueous leaf extracts of Centella asiatica showed inhibitory effects on the seed germination (%), shoot length and root length of crop plants Pennisetum typhoides (pearl millet) and Vigna unguiculata (cowpea). It was noted that aqueous leaf extracts at a concentration of 5, 10, 15, 20 and 25% inhibitory effect on pearl millet and cowpea germination and the effect was found significantly higher than control treatment. The fresh and dry weight of all the treated plants was also reduced significantly compared to the control. The extracts also inhibited the shoot and root length of Pearl millet and Cowpea seedlings with increases in leaf extracts concentration. In the present study, the results showed that the inhibitory effect might be due to the presence of some allelochemicals in the aqueous leaf extracts of Centella asiatica.

Key words: Allelopathy, Allelopathic effects, aqueous leaf extract, seed germination, *Centella asiatica, Vigna unguiculata*, *Pennisetum typhoides.*

INTRODUCTION

Centella asiatica (L.) Urban. (Apiaceae) is a perennial creeper growing abundantly in moist areas in parts of India, Sri Lanka, China, Indonesia, Malaysia and Africa. It has been used in folk medicine for leprosy, tumor, syphilis, tuberculosis and to improve mental function (Kartnig, 1988). *C. asiatica* is also used as a diuretic, stimulant, brain tonic and narcotic. It is used for many diseases viz., headache, ambiguous, coma, skin tuberculosis blood and mental weakness. It is an external and internal remedy to epilepsy, various skin diseases, youth, memory and long life (Kirtikar and Basu, 1933; Anonymous, 1966; Nadkarni, 1976). It is used as hepato-protective and as an antioxidant (Antony *et al.,* 2006; Zainol *et al.,* 2008). Sterols, tannins, sugars, alkaloids, glycosides, amino acids, viz., glycine, aspartic acid,

[1] Department of Botany, Government Arts College (Autonomous), Salem – 636 007, Tamilnadu, India. E–mail:alagesaboopathi@rediffmail.com

flavones, quercetin were recorded in the plant (Singh and Rastogi, 1969).

Allelopathy refers to inhibitory or stimulatory effects of one plant on other plants through release of allelochemicals in the environment. Allelopathic substances influence all the major living organisms in natural communities, the trees exert allelopathic effects through release of allelochemicals (Chandra Babu and Kandasamy, 1997), *Eucalyptus globules* though a potential industrial crop is not being recommended as an intercrop in agroforestry system due to the suspected release of compounds from its trees, which inhibit the growth of other crop plants (Chandra Babu and Kandasamy, 1997). Alam and Islam (2002) reported that plants produce allelochemicals which interfere with other plants and affect seed germination and seedling growth. The importance of allelopathy in biological control of weeds and crop productivity has been highly recognized and various methods have been suggested to study the allelopathic effect (Rice, 1984).

Allelopathic effects include reduced seed germination and seedling growth. Allelopathic inhibition is complex and can involve the interactions of different classes of chemical like flavonoids, alkaloids, steroids, terpenoids, phenolic compounds and amino acids. However, many of these phytochemicals have been reported to have allelopathic effects, which inhibit seed germination and growth in many other crop plants (Bensal *et al.,* 1992; Prasad and Subhashini, 1994). Hence, laboratory experiments were undertaken to study the behavior of phytochemicals present in *C. asisatica* (Local Name: Vallarai) extracts in germination and seedling growth of *Pennisetum typhoides* and *Vigna unguiculata.*

MATERIALS AND METHODS

Mature fresh leaves of *Centella asiatica* were collected in December 2008, from Shevaroy Hills, Salem district, Tamilnadu, India. These were shade dried for 10 days, then powdered in grinders and sieved. For leaf extract, 25 g leaf powder was soaked in 100 ml distilled water for 24 h to get 25% extract. By dilutions of the stock suspension with distilled water 5, 10, 15, 20 and 25% concentrations of extracts were prepared. Seeds of *Pennisetum typhoides* (pearl millet) and *Vigna unguiculata* (cowpea) were procured from seed store, Salem. Seeds were selected for uniformity and were surface sterilized with 0.1% mercuric chloride for 2 min. and repeatedly washed with sterilized distilled water. The seeds were soaked in different concentrations of extracts for 24 h or in distilled water. The experiment was done in 11 cm diameter Petri dishes lined with sterile cotton under the laboratory temperature of 28°C and 12 hrs. light.

Each Petri dishes contained ten uniform sized seeds, which were soaked with 10 ml distilled water on alternate days. The experiment was laid out in the completely randomized design. The growth parameters germination %, root length, shoot length, fresh weight and dry weight were determined on the 8th day after germination. Distilled water was used as a control. Each treatment was replicated thrice. The data were recorded on seed germination (%), shoot length (cm), root length (cm), fresh weight (g) and dry weight (g) according to the standard procedures (Heisey, 1990).

RESULTS AND DISCUSSION

All the leaf extracts significantly decreased pearl millet (*Pennisetum typhoides*) and cowpea (*Vigna unguiculata*) seed germination as compared to the control (Tables-1 and 2). The decrease in percent Pearl millet seed germination in the *C. asiatica* extract treatments ranged between 20 to 63% compared to 92% germination in the control. The decrease in germination percentage of *Vigna unguiculata* was found to be from 18 to 64% compared to 88% germination in the control.

The results of present investigation study showed that the leaf extracts of *C. asistica* were inhibitory in both Pearl millet and cowpea. Similar results have been reported by Heisey (1990). The pearl millet and cowpea shoot and root length were reduced a maximum of 64% and 36%, respectively. The degree of retardation also increased with the increase in the concentration of the extracts. The extracts of *C. asiatica* also significantly affected seedling growth of Pearl millet and Cowpea. The extracts not only decreased the shoot and root length of Pearl millet and Cowpea seedlings but also reduced the fresh and dry weight. The dry matter accumulation of shoot and root of Pearl millet and Cowpea also was significantly affected. The reduction in the fresh and dry weight may be due to stunted and meager vegetative growth of Pearl millet and cowpea seedling.

The leaf extracts of *C. asiatica* affected the shoot length of the crop plants more than the root length. Inhibition of pearl millet, sesame and in cluster seedling growth by the extracts of *Acacia tortillis* has been reported in a few crops and weed species (Sundramoorthy and Katra, 1991). Allelochemical activity of plant is measured by the sensitivity of roots in the bioassay (Heisey, 1990). The *C. asiatica* leaf extracts inhibited the germination and growth of pearl millet and cowpea in the present study. Seed germination, growth and dry matter accumulation of root and shoot of both the plants were progressively decreased with the increase in the concentration of the extracts.

Table-1. Effects of aqueous extracts of *Centella asiatica* leaves on germination and seedling growth of *Pennisetum typhoides*.

Extract concentration (%)	Germination (%)	Shoot length (cm)	Root length (cm)	Fresh weight (g.)	Dry weight (g.)
Control	92	0.995	0.946	0.0064	0.0028
5	63	0.862	0.845	0.0062	0.0103
10	51	0.762	0.700	0.0187	0.0031
15	32	0.453	0.650	0.0043	0.0019
20	21	0.325	0.500	0.0025	0.0083
25	20	0.184	0.308	0.0023	0.0192
SD	57.51	0.721	0.760	0.011	0.011
SE	23.48	0.294	0.310	0.005	0.004

SD ± indicates Standard Deviation
SE ± indicates Standard Error

Table-2. Effects of aqueous extracts of *Centella asiatica* leaves on germination and seedling growth of Cowpea.

Extract concentration (%)	Germination (%)	Shoot length (cm)	Root length (cm)	Fresh weight (g.)	Dry weight (g.)
Control	88	0.995	0.750	0.058	0.020
5	64	0.850	0.700	0.020	0.009
10	48	0.805	0.650	0.041	0.090
15	34	0.790	0.500	0.230	0.102
20	22	0.650	0.450	0.042	0.024
25	18	0.550	0.375	0.042	0.024
SD	26.815	0.233	0.635	0.110	0.063
SE	10.949	0.095	0.259	0.045	0.026

SD ± indicates Standard Deviation
SE ± indicates Standard Error

REFERENCES CITED

Alam, S.M. and E.U. Islam. 2002. Effect of aqueous extract of leaf, stem and root of nettle leaf goosefoot and NaCl on germination and seedling growth of rice. Pak. J. Sci. Tech. 1(2): 47-52.

Anonymous. 1966. The Wealth of India. Vol. II ‘C’, CSIR, New Delhi.

Antony, B., Santhakumari, G., Merina, B., Sheeba, V. and Mukkadan. 2006. Hepatoprotective effect of *Centella asiatica* (L.) in carbon tetrachloride induced liver injury in rats Indian J. Pharm. Sci. 68: 772-776.

Bensal, G.L., H. Nayyar and Y.S. Bedi. 1992. Allelopathic effects of *Eucalyptus macrorrhynacha*, Niha and *E. youmanii* on seedling growth of wheat (*Triticum aestivum*) and radish (*Raphanus sativus*). Indian J.Agric. Sci.62:771-772.

Chandra, B.M. and O.S. Kandasamy. 1997. Allelopathic effects of *Eucalyptus globules* Labill on *Cyprus rotundus* L. and *Cynodon dactylon* (L.) Pers. J. Agron. Crop Sci. 179:123-126.

Heisey, R.M. 1990. Allelopathic and herbicidal effects of extracts from tree of heaven *(Ailanthus altissima)*. American J. Bot. 77:662-670.

Kartnig, T. 1988. Herbs, spices and medicinal plants recent advances in Botany, Horticulture and Pharmacology. Oryx press, Phoenix 3rd ed. pp.145-173.

Kirtikar, K.R. and B.D. Basu, 1933. Indian Medicinal Plants. Vo. II. Allahabad, India.

Nadkarni, A.K. 1976. Indian materia medica. Popular Prakashan, Bombay, India.

Prasad, M.N.V. and D.Subhashini, 1994. Mimosine inhibited seed germination. Seedling growth and enzymes of *Oryza sativa* L. J. Chem. Ecol. 20:1689-1696.

Rice, L.E. 1984, Allelopathy, Academic Press, New York.

Singh, B. and R.P. Rastogi, 1969. A reinvestigation of triterpenes of *Centella asiatica.* Phytochem. 8: 917-921.

Sundramoorthy, S. and A. Katra. 1991. Allelopathic potential *Acacia tortillis* plantation in Indian desert. Annals of Arid Zone 30:259-266.

Zainol, N.A., S.C. Voo, M.R. Sarmidi and R.A. Aziz. 2008. Profiling of *Centella asiatica* (L.) Urban extract. The Malaysian J. Analy. Sci. 12:322-327.