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ALLELOPATHIC POTENTIAL OF AQUEOUS EXTRACTS OF *CENTELLA ASIATICA* (L.) URBAN ON GERMINATION AND SEEDLING GROWTH OF *ORYZA SATIVA* L. VARIETIES FROM TAMILNADU, SOUTH INDIA

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ABSTRACT

In the present investigation, the leaf and stem extracts of Centella asiatica (L.) Urban, noted inhibitory effects on seed germination, shoot length, root length, fresh and dry weight in rice (Oryza sativa L. Var. ADT 45 and Var.Deluxe Ponni). The results noticed that the extracts brought about considerable inhibition in the germination of Oryza sativa Var. ADT 45 and Var. Deluxe Ponni seeds and in the growth of its root and shoot. The allelopathic effect of leaf and stem extracts of C.asiatica decreased the seed germination of Oryza sativa varieties with raise in the extracts concentration. The extracts also inhibited the shoot and root length of O.sativa seedlings with increase in C.asiatica extract concentration. These result revealed that the inhibitory effect potency be due to presence of these allelochemicals such as phenols, tannins, saponins and sterols etc., in the aqueous leaf and stem extracts of C.asiatica from the present research C.asiatica leaf extracts were more detrimenteal than stem extracts.

KEY WORDS

Allelopathy, Oryza sativa, Centella asiatica, Aqueous extracts.

INTRODUCTION

Allelopathy was defined as the manage or indirect harmful or beneficial effects of one plant or another through the production of phytochemical compounds that escape into the environment [1]. Allelopathic chemicals can be present in any part of the plant. They can be found in leaves, roots, stems, flowers, seeds, pollen, seeds or sometimes found in just one or two parts [2].

Allelopathy is also regarded as phytochemical warefare. Plants inhibit the seed germination and development of other plants by means of producing toxic chemicals. i.e. allelopathins or allelochemicals. Chemicals from the development of adjacent plants, therefore the role of allelochemicals in agro-ecosystem has attracted the attention of several scientists. Numerous medicinal and aromatic plants which produce and accumulate extensive amounts of secondary metabolites possibly have pronounced determine on the development and distribution of flora in their area, but very short work has been done in these areas.

Mathela (1994) [3] studied that the secondary metabolities (steroids, diterpenoids, flavonoids and glycosides) of some medicinal and aromatic plants recorded for allelopathic and aromatic plants recorded for allelopathic potential. Alagesaboopathi (2011) [4] reported that leaves, stem and roots extracts of *Andrographis paniculata* essentially decreased germination and seedling progress in *Sesamum indicum*. Alagesaboopathi (2016) [5] studied allelopathic effect of *Strychnos nux-vomica,* which noted inhibition in germination and seedlings growth of *Solanum trilobatum*. There are numerous reports allelochemicals from this plant negatively concern plants such as

Euphorbia thiamifolia, *Tithonia diversifolia, Erythroxylum monogynum* and *Plumbago Zeylanica, Calytocarpus vialis* [6-10].

Centella asiatica (L.) Urban is a tropical medicinal plant from Apiaceae family native to southeast Asian countries such as India, China, Indonesia, Sri Lanka and Malaysia. *C.asiatica* familiarly known as Vallarai in Tamil; Indian Pennywort in English; Budhbrahmani in Hindi. *C. asiatica* is one of the essential herbs for treatment of skin disorders to heal wounds, for revitalizing the nerves and brain cells, hence initially known as a "Brain food" in India [11].

The utilize of *Centella* in food and beverages has increased over the years essentially due to its health benefits such as anti-inflammatory, antioxidant, wound healing, memory enhancing property [12]. The plant is used for treatment of antimicrobial activity [13] cytotoxic and antitumour [14]. The plant is used for treatment of leprosy, asthma and also to improve memory.

The plant is used as a tonic and used in bronchitis [15]. Hence, in this research was carried out to conclude the allelopathic effects of *Centella asiatica* aqueous leaf and stem extracts on the seed germination and seedling growth of *Oryza sativa* Var. ADT.45 and Var. Deluxe Ponni. This study was conducted under laboratory conditions.

MATERIAL AND METHODS

Mature fresh healthy leaves of *Centella asiatica* were collected in January 2017 from the natural population Shevaroy Hills, Salem district of Tamilnadu. The freshly collected leaves were washed thoroughly in tap water, shade dried at room temperature (30^{o}C) for 10 days, then powdered in grinders and sieved. For leaf extract, 25g, leaf powder was soaked in 100ml double distilled water for 24 hrs to get 25% extract. By dilutions with double distilled water 2.5, 5.0, 7.5, 10 and 12.5% concentrations of extracts were prepared.

The seeds of *Oryza sativa* L. Var. ADT 45 and Var. Deluxe Ponni selected for the present research were collected from Agriculture Office, Attur, Salem district of Tamilnadu, India. The seeds of *Oryza sativa* Var. ADT 45 and Var. Deluxe Ponni were surface sterilized with 0.1% mercuric chloride for 1 min. to eliminate fungal spores on the seeds.

Then the seeds were washed with double distilled water for several times to remove the mercuric chloride. The seeds were soaked in different concentrations of extract for 24 hrs. The research was done in 11 cm dia petri dishes lined with sterile cotton. Each Petri dish contained 10 regular sized seeds, while seeds in double distilled water were maintained as control separately which were irrigated with 15 ml of distilled water on alternative days. The experimental plan was randomized whole block with three replicates for each treatment and control measurement of germination percentage, shoot and root length, fresh weight, and dry weight were carried out using standard methods. Each treatment of this research was carried out with two replications and repeated two times. The data obtained were analyzed by factorial analysis of variance (ANOVA) to assure indicative ($P<0.05$) determines.

RESULTS AND DISCUSSION

In the present investigation, both leaf and stem extract of *Centella asiatica* inhibited the germination of *Oryza sativa* Var. ADT-45 and Var. Deluxe Ponni. Highest inhibition effect was noted with concentrated leaf extracts. Germination percent of *Oryza sativa* Var. ADT-45 and Var. Deluxe Ponni was heavily decreased in accordance with increased extract concentration (7.5, 10 and 12.5%). Maximum inhibition (80%) was observed with concentrated leaf extract. Leaf and stem aqueous extracts of C. *asiatica* on *Oryza sativa* Var. ADT-45 and Var. Deluxe Ponni showed a gradual reduction in all parameters. The seed germination, root and shoot length were inhibited in all concentrations (Tables 1-4). At the highest concentration studied, a maximum of 36 and 80% of reduction in seed germination was observed in leaf extracts on *Oryza sativa* Var. ADT-45 and Var. Deluxe Ponni.

Table – 1: Effects of aqueous extract of *Centella asiatica* Urban leaves on germination and seedlings growth of *Oryza sativa* L. Var. ADT-45.

S.No.	Extract Concentration %	Seed Germination %	Shoot Length (cm)	Root Length (cm)	Fresh Weight (g)	Dry Weight (g)
1	Control	93	7.80	9.30	1.87	0.61
2	2.5	64	5.12	8.01	1.17	0.40
3	5.0	53	4.50	7.90	1.01	0.32
4	7.5	48	4.41	7.81	0.71	0.29
5	10	30	3.93	5.14	0.41	0.18
6	12.5	20	2.52	4.01	0.20	0.15

Figure – 1: Effects of aqueous extract of *Centella asiatica* Urban leaves on germination and seedlings growth of *Oryza sativa* L. Var. ADT-45.

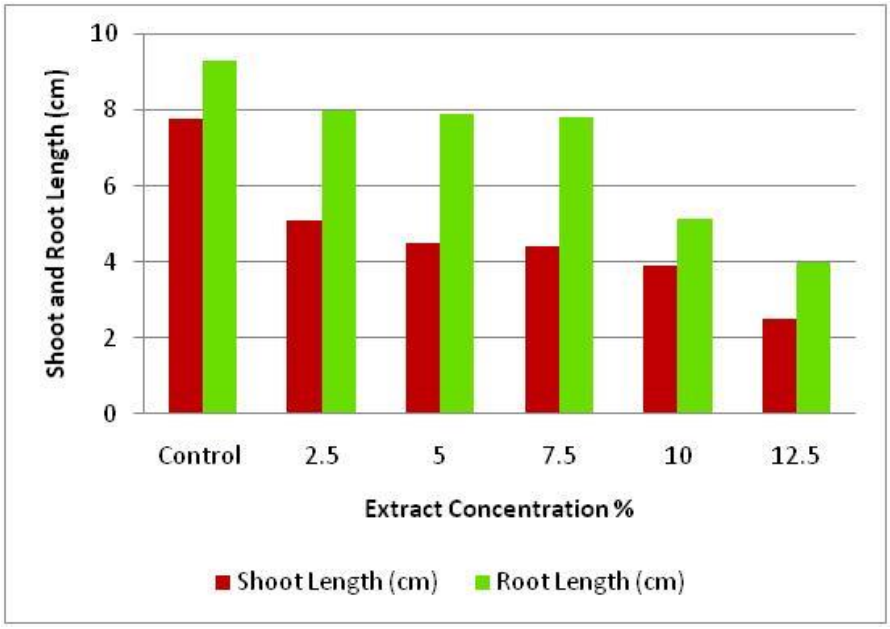


Table – 2: Effects of aqueous extract of *Centella asiatica* Urban stem on germination and seedlings growth of *Oryza sativa* L. Var. ADT-45.

S.No.	Extract Concentration %	Seed Germination %	Shoot Length (cm)	Root Length (cm)	Fresh Weight (g)	Dry Weight (g)
1	Control	93	8.90	9.30	1.92	0.61
2	2.5	69	6.70	10.70	1.37	0.44
3	5.0	56	5.40	9.30	1.04	0.39
4	7.5	51	5.10	8.1	0.90	0.30
5	10	44	4.30	7.21	0.52	0.26
6	12.5	28	3.15	5.11	0.38	0.20

Figure – 2: Effects of aqueous extract of *Centella asiatica* Urban stem on germination and seedlings growth of *Oryza sativa* L. Var. ADT-45.

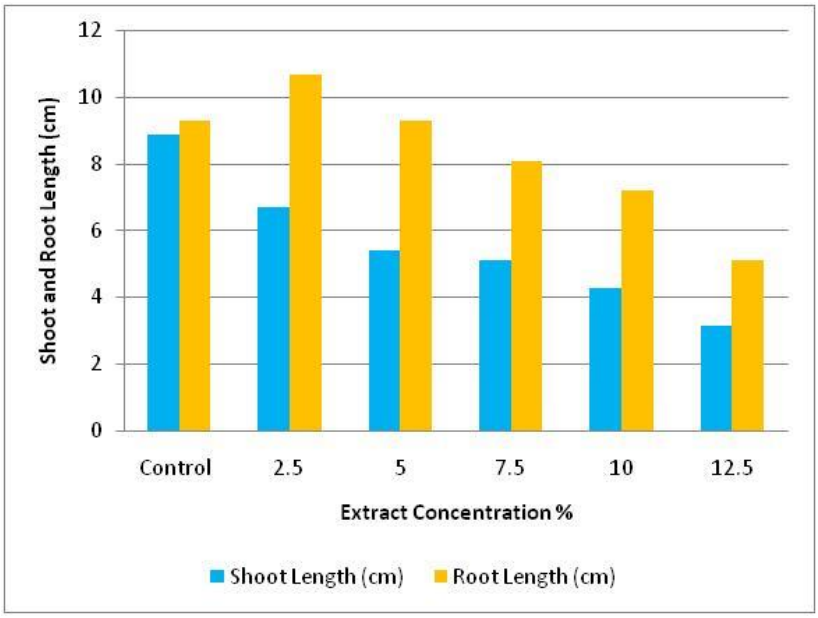


Table – 3: Effects of aqueous extract of *Centella asiatica* Urban Leaves on germination and seedlings growth of *Oryza sativa* L. Var. Deluxe Ponni.

S.No.	Extract Concentration %	Seed Germination %	Shoot Length (cm)	Root Length (cm)	Fresh Weight (g)	Dry Weight (g)
1	Control	85	17	9.35	0.80	0.18
2	2.5	60	14.5	4.01	0.61	0.11
3	5.0	48	13.17	3.96	0.48	0.09
4	7.5	44	10.25	2.80	0.36	0.08
5	10	32	8.11	2.01	0.24	0.06
6	12.5	21	5.24	1.95	0.19	0.04

Figure – 3: Effects of aqueous extract of *Centella asiatica* Urban Leaves on germination and seedlings growth of *Oryza sativa* L. Var. Deluxe Ponni.

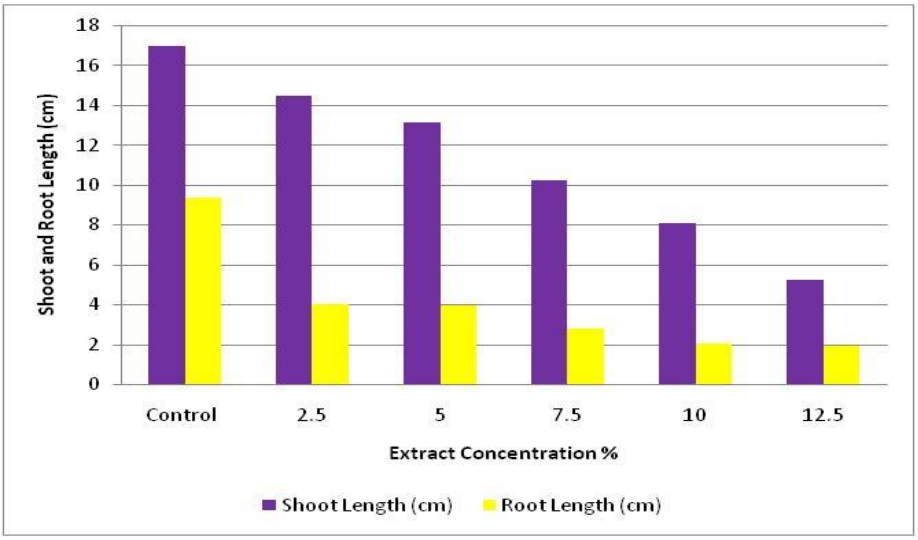
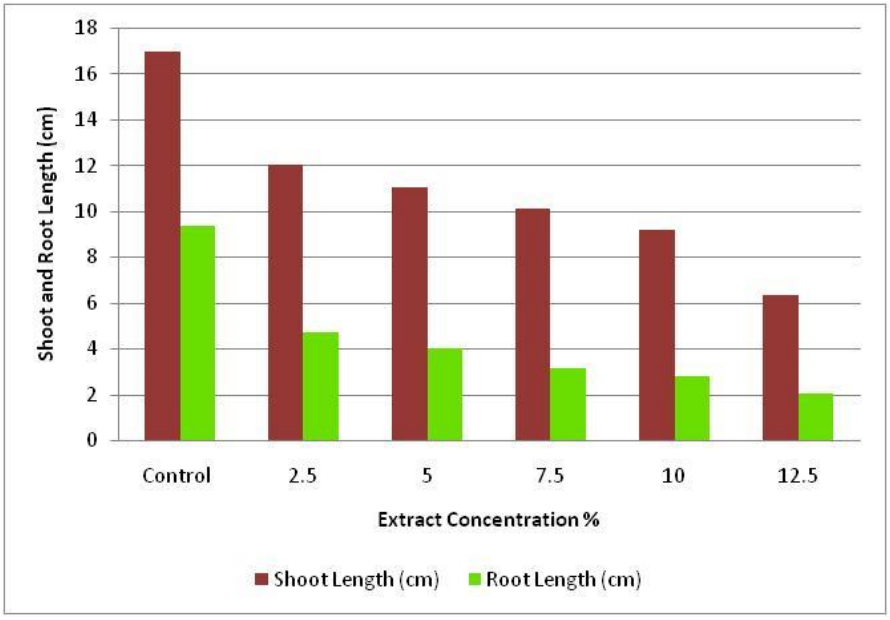


Table – 4: Effects of aqueous extract of *Centella asiatica* Urban Stem on germination and seedlings growth of *Oryza sativa* L. Var. Deluxe Ponni.

S.No.	Extract Concentration %	Seed Germination %	Shoot Length (cm)	Root Length (cm)	Fresh Weight (g)	Dry Weight (g)
1	Control	88	17	9.35	0.80	0.18
2	2.5	67	12.06	4.73	0.66	0.13
3	5.0	52	11.07	4.01	0.51	0.10
4	7.5	50	10.15	3.12	0.42	0.09
5	10	42	9.21	2.81	0.29	0.08
6	12.5	30	6.33	2.03	0.22	0.05

Figure – 4: Effects of aqueous extract of *Centella asiatica* Urban Stem on germination and seedlings growth of *Oryza sativa* L. Var. Deluxe Ponni.



Similar trend was followed in shoot and root length. In *O.sativa* Var. ADT-45 and Var. Deluxe Ponni a maximum of 62 and 38% reduction was recorded in shoot and root length respectively. The aqueous extracts of two extracts also retarded the shoot lengths of *Oryza sativa* Var. ADT-45 and Var. Deluxe ponni (Tables 1-4, Figures 1-4). The degree of retardation also increased with the increase in the concentrations of the extracts. Statistical analysis at 5% level (t-test) revealed that apart from comparison between 2.5 and 12.5% extract concentrations, these were no significant differences in the growth length of root in the varying extract concentration as well as those of the control in both the extract. The extracts of *C. asiatica* also caused significant reduction in seedling growth of *O.sativa* Var. ADT-45 and Var. Deluxe Ponni. The extracts not only reduced the shoot and root length of *O.sativa* Var. ADT-45 and Var. Deluxe Ponni seedling but also reduced the fresh and dry weight may be due to strunted and meager vegetative growth of *O.sativa* Var. ADT-45 and Var. Deluxe Ponni seedling. This reduction may be due to phytotoxic activity of phytochemicals present in aqueous extracts of *C.asiatica.*

Alagesaboopathi (2010) [16] reported that allelopathic effect of *Centella asiatica* on germination and seedling growth of *Pennisetum typhoides* and *Vigna ungiculata.* Some current investigation indicating the allelopathic determine of aqueous extracts of *Sorghum* and Sunflower [17], *Parthenium hysterophorus* [18], *Tamarindus indica* [19] and *Acacia auriculiformis* [20]. Kumbhar and Dabeger (2011) [6] reported that allelopathic effects of aqueous extracts of *Euphorbia thiamifolia* on germination and seedling growth of *Cajanus cajan.* Allelochemical activity of plant is

measured by the sensitivity of roots in the bioassay [21]. Allelopathy is one of the stated phenomena of phytochemical interaction exhibiting extensive importance in real ecosystems [22]. All these investigations indicated the discharge of allelopathic phytochemicals during the preparation of water extracts. The found inhibitory potential in seed germination, root length and shoot length and other primary parameters.

CONCLUSION

The present study was conducted to investigate the allelopathic potential of *Centella asiatica* (L.) Urban. Which showed inhibitory effects on seed germination, root length and shoot length of *Oryza sativa* L. (Rice) Var.ADT-45 and Var. Deluxe Ponni, Leaf and stem aqueous extracts of *Centella asiatica at* 2.5, 5.0, 7.5, 10 and 12.5% concentration were applied to determine their effect on seed germination and seedling development of *Oryza sativa* Var.ADT-45 and Var. Deluxe Ponni under laboratory conditions. Results notable that seed germination, root length, shoot length, fresh weight and dry weight of *Oryza sativa* Var. ADT-45 and Var. Deluxe Ponni were significantly decreased by leaf and stem extracts compared with control treatments. Roots were large affected than shoots. Leaf extracts were more reduced than stem extracts. These outcomes revealed that the inhibitory and stimulatory effect potentialities may be due to the presence of the allelpchemicals such as phenols, terpenoids, alkaloids, steroids and tannins etc. in the aqueous leaf and stem extracts of *Centella asiatica* from the present research.

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