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Phyto-toxicity of *Alternanthera species* on Germination of *Zea mays* (Maize) Crop

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Abstract
Alternanthera species is regarded harmful weed. It belongs to family Amaranthaceae. Phytotoxicity involves both inhibitory and biochemical interactions between plants. Alternanthera species toxic effect studies have been done on crops such as Baby corn (Zea mays) in laboratory conditions to determine their phytotoxic potential and its use. In the present study phytotoxic effect of leaf extract (2%, 6% and 10%) of Alternanthera species on percent seed germination of Zea mays crop was studied. it was found that among Zea mays was most affected with zero percent seed germination with 6% and 10% of the Leaf extract. Maximum percent of seed germination (0%) was recorded with Zea mays at 10%. Alternanthera leaf extract was found toxic to Maize seeds at 6% and 10% respectively.

Keywords: Phytotoxicity, crops, germination, *Alternanthera* species, seeds

1. Introduction
Phytotoxicity is defined as the harmful effect of one plant upon other. A more complete definition includes the positive and negative effects of chemical compounds produced mainly from the secondary metabolism of plants and microorganism, viruses and fungi that have an influence upon the growth and development of agriculture and biological ecosystem (Kruse *et al*., 2000; Olofsdotter *et al*., 2002; Rice, 1984; Seigler 1996; Bertin *et al*., 2003) [13, 16, 21, 23, 2]. It is notorious that majority of allelochemicals are product of secondary metabolism. Based on these precursors, secondary metabolites can be grouped into three main chemical classes- Terpenoids, nitrogen containing compounds and phenolic compounds, Alkaloids, Glycosides, tri-terpenoids etc. *Alternanthera species* is one of the plants which possess strong phytotoxic effects on other plants by secreting the secondary metabolites. The secondary metabolites also includes the allelochemicals such as phenolic acids, alkaloids, Glycosides, Flavanoides and Terpenoides, Report on allelochemicals and their biological activity such as allelopathy, Phytotoxicity, herbicidal activity, inhibition and regulation of growth regulation are documented earlier. Phytochemical screening revealed that leaf; contain tannin, catachin, saponin, steroids, alkaloids, phenol, anthroquinone, protein, several tri-terpenoids, flavonoids, alkaloids, glycosides.

2. Materials and methods
2.1 Collection of Plant Material

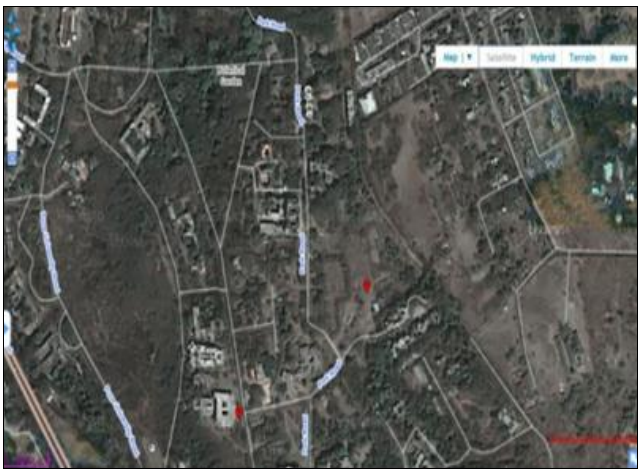

Fig 1: Map of Study area (www.isro.gov.in)

The leaves of the *Alternanthera species* were collected from the area surrounding the Department of Environmental Sciences and SPPU University Campus. The leaves were collected randomly from 5-6 plants and were pooled together for further experimental study.

2.2 Preparation of leaf aqueous extract

The 60 gm leaves of *Alternanthera species* was grinded in a Mixer by adding 600 ml sterilized distilled water and then 10% aqueous extract was prepared. The extracts were filtered through funnel with Whatman filter paper no.1 and were stored at room temperature under dark condition for 24 hours until further use. After 24 hours different concentration (2%, 6%, and 10%) of the leaf extract were prepared by adding sterilized distilled water.

2.3 Seeds

Seeds of the plants such as Baby corn (*Zea mays*) and were purchased from Damani Seed Developers, Shivajinagar, and Pune.

2.4 Assessment of Phytotoxicity of the *Alternanthera* leaf extracts

The following parameters were used to assess the Phytotoxicity of the Leaves of *Alternanthera species* on the seeds of *Zea mays* crop.

2.4.1. a. Effect of the leaf extract of *Alternanthera* species on seed germination of the Maize seeds (*in vitro)*.

2.4. b. Germination Assay

2.4c. Surface sterilization of seeds

Ten seeds of each plant in triplicate were sterilized with 0.1% $HgCl_2$ solution (0.5g $HgCl_2$ powder was dissolved in 500 ml distilled water) for 5 sec. The surface sterilized seeds were washed with sterilized distilled water in laminar air flow cabinetfor 4-5 times before using for the germination assay.

2.5. Statistical analysis

All the experiments were performed in triplicates. The mean and Average calculated using MS Excel 2007.

3. Results and Discussion

3.1 Assessment of Phytotoxicity of the Leaf extracts of *Alternanthera species*

After eight days of incubation at room temperature the percent germination was calculated. The details of the percent seed germination plant wise is as below:

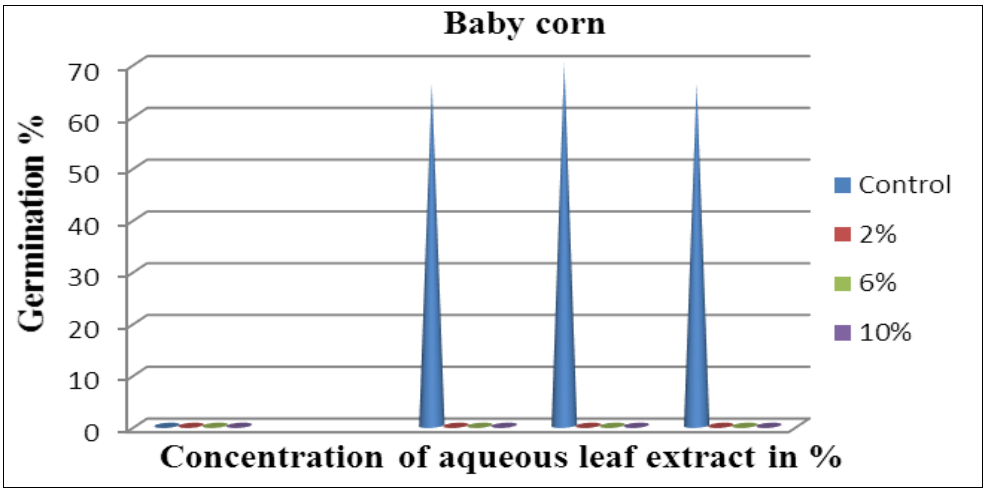

Fig 2: Phytotoxicity of Leaf extract of *Alternanthera species* on the seeds of VI: Baby corn, at different concentrations of the Leaf extract (A: Control, B: 2%, C: 6% and D: 10%)

Table 1: Percent seed germination of six plant varieties at 2, 6, and 10% compared with Control sample.

Sr. no	Treatment Crop	Treatment	% Germination (in Triplicates)			Average
			1	2	3	
1	F1Baby Corn	Control	66	70	66	67.33
		2%	0	0	0	
		6%	0	0	0	
		10%	0	0	0	

4. Discussion

The phytotoxic effects of different concentrations of aqueous leaf extracts and leaf leachates from leaves of *L. camara* were inhibitory to all parameters viz., seed germination to metabolism of mung bean (*Vigna radiata*) seeds (Maiti *et al*., 2010). Leaf extract of *Lantana camara L*. showed a wide variation in the reduction of the germination rate of seeds of both the vegetable species, radish (*Raphanus sativus L*.) and spinach (*Spinacia oleracea L*.) over the control. The 100% concentration of leaf extract showed maximum inhibition followed by 50% leaf extract (Mishra *et al*., 2015) there are similar inhibition of aqueous extract *of Lantana species* observed in this research work.

According to (Solomon Charles Ugochukwu *et al*., 2013) results obtained for qualitative screening of phytochemicals in stem bark and roots of *D. tripetala* are presented four phytochemicals screened for, nine were found present in various solvent extracts. They are alkaloid, cardiac glycosides, flavonoids, phenols, carbohydrates, saponins, sterols, tannins and terpenoids. In all, more phytochemicals were found present in the stem bark than in the roots. Remarkably, flavonoids and saponins were not present in roots but present in stem bark. This suggests that the stem bark offers a wider array of phytochemicals than the root, From the stem bark, water extract showed the presence of alkaloid, cardiac glycosides, carbohydrate, flavonoids, phenol, saponins and tannin. However, 70% ethanol and acetone had alkaloid, cardiac glycosides, carbohydrates, flavonoids, phenol, saponins, tannins and terpenoids. The stem bark methanol extract had the presence of alkaloid, cardiac glycosides, carbohydrate, flavonoids, phenol, sterols, tannins and terpenoids, In this research work the Phytochemicals were observed similar with *D. tripetala*. Therefore leaf extract of *Alternanthera species* showed presence of alkaloid, flavonoids, triterpenoid and terpenoid which affects the germination of Agricultural crops.

(Solomon Charles Ugochukwu *et al*., 2013).

5. Conclusion

Based on the present study following conclusions can be drawn: (1) the leaf extract of the *Alternanthera species* do possess Phytotoxicity on *Zea mays* crop. (2) Due to its strong toxic potential *Alternanthera species* may lead to huge loss of agricultural production per annum if not handled properly.

6. Acknowledgement

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7. References

1. Bennet SSR. Ethnobotanical studies in west Sikkim. Journal of Economic and Taxonomic Botany. 1985; **7**:317-321.
2. Bertin C, Yang X, Weston LA. The role of root exudates and allelochemicals in the rhizosphere. Plant Soil. 2003; 256: 67-83.
3. Damjanoviae-Vratnica B, Dakov T, Sukoviae D, Damjanoviae J. Chemical composition and antimicrobial activity of essential oil of wild-growing Salvia officinalisL. from Montenegro. Journal of Essential Oil Bearing Plants. 2008; 11**:**79-89.
4. Das B, Das R. Chemical investigation in *Parthenium hysterophorus* L.: an alleopathic plant. Allelopathy Journal. 1995; 2**:**99-104.
5. Demissie AG, Ashenafi A, Arega A, Etenash U, Kebede A, Tigist A. Effect of *Parthenium hysterophorus*L. on Germination and Elongation of Onion (*Allium cepa*) and Bean (*Phaseolusvulgaris*). Research Journal of Chemical and Environmental Sciences. 2013; 1(2):17-21
6. Dogra KS, Sood SK. Phytotoxicity of Parthenium hysterophorus residues towards growth of three native plant species (Acacia catechu willd, Achyranthesaspera L. and Cassia tora L.) in Himachal Pradesh, India. International Journal of Plant Physiology and Biochemistry. 2012; 4(5):105-109. DOI: 10.5897/ IJPPB11.009
7. Fay PK, Duke WB. An assessment of allelopathic potential in *Avena*germplasm. Weed Science. 1977; 25:224-228.
8. Gnanavel. *Parthenium hysterophorus* L. A Major Threat to Natural and Agro Eco-systems in India.Science International. 2013; 1:186-193, DOI: 10.5567/ sciintl. 2013; 186:193.
9. Mawal SS, Mohd S, Sangale M, Ade A. Assessment of Allelopathic Potential of the Roots of *Parthenium hysterophorus* L. on Some Selected Crops. International Journal of Scientific Research in Knowledge. 2015; 3(6):0145-152.
10. McDonald IDU, Ovuakporie-Uvo Oghale. Studies on allelopathic effect of aqueous extract of Ageratum conyzoides Asteraceae on Seedling Growth of *Sesanumindicum* L. International Journal of Science, Environment and Technology. 2013; 2(6):1185-1195.
11. Molisch H. Der Einflusseiner flanze auf die and ere-Allelopathie. Fischer, Jena, 1937.
12. Kanchan SD, Jayachandra. Allelopathic effects of Parthenium hysterophorus L. IV. Identification of inhibitors. Plant and Soil. 1980; 55:67-75.
13. Kruse M, Strandberg M, Strandberg B. Ecological effects of allelopathic plants—a review. Silkborg, Denmark: Ministry of Environment and Energy, National Environmental Research Institute Technical Report. 2000; 315:66.
14. Maharajan S, Shrestha BB, Jha PK. Allelopathic effects of aqueous extract of leaves of *Parthenium hysterophorus* l. on seed germination and seedling growth of some cultivated and wild herbaceous species). Scientific World. 2007; 5:5.
15. Miller DA. Allelopathy in forage crop systems. Agronomy Journal 88: 854-859. Narasimhan TR, Harindranath N, Kurup CK, and Rao PV (1985) Effect of parthenin on mitochondrial oxidative phosphorylation. Biochemistry International. 1996; 11:239-244.
16. Olofsdotter M, Navarez D, Moody K. Allelopathic potential in rice (*Oryza sativa* L.) germplasm, Annals of Applied Biology. 1995; 127:543-560.
17. Picman J, Picman AK. Autotoxicity in *Parthenium hysterophorus* and its possible role in control of germination. Biochemical Systematics and Ecology. 1984; 12:287-292.
18. Picman AK. Biological activities of sesquiterpene lactones. Biochemical Systematics and Ecology. 1986; 14:255-281.
19. Pandey DK. Relative toxicity of allelochemicals to aquatic weeds. Allelopathy Journal. 1996; 3:240-246.
20. Putnam AR. Adverse impacts of *allelopathy* in agricultural system. In: Putnam AR, Tang CS (Eds) The Science of Allelopathy, John Wily and Sons, New York, 1986. Qasem JR. Allelopathic potential of White top and Syrian sage on vegetable crops. Agronomy Journal. 2001; 93:64-71.
21. Rice EL. Allelopathy. Academy Press Inc. Ltd., London, 1984.
22. Maharjan S, Shrestha BB, Jha PK. Allelopathic Effect of Leaves Extract of Parthenium hysterophorus L. on seed Germination and Seedling Growth of Some Cultivated and Herbaceous species. Central Department of Botany, Tribhuvan University, Kirtipur, Kathmandu, Nepal, Scientific World. 2007; 5:5.
23. Seigler DS. Chemistry and mechanisms of allelopathic interactions. Agronomy Journal. 1996; 88:876-885.