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Comparative studies of seed germination of okra and radish in response to aqueous application of extract of *Pluchea lanceolata*

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ABSTRACT

Pluchea lanceolata *(DC.) C.B. Clarke (Asteraceae) is a rapidly spreading perennial dicot weed in semiarid areas of north-west India [12]. Allelochemicals are released into the environment through leaching from living plant parts, root exudates, volatilization, residue decomposition, microbial activity, and agricultural practices such as plowing of plant residues into the soil [1] [11]. To explore allelopathic potential of P. lanceolata on vegetable crop we examined the effect of aqueous extract of shoots of this plant on seed germination of okra and radish.*

Keywords: *Pluchea lanceolta*, Germination, Radish, Okra

INTRODUCTION

Invasion by the alien plant species is responsible for the homogenization of floras and is a substantial threat to biodiversity and ecological integrity of native habitats and ecosystems [2] [3]. Invasive species are also thought to jeopardize the survival of plant species which are already endangered or threatened around the world [18].

Pluchea lanceolata is an aggressive, pernicious, rhizomatous evergreen weed of the north-western parts of India both in cultivated and uncultivated areas [20][5]. It also occurs in North Africa, Afghanistan and Pakistan [16][17]. It causes considerable damage to winter and summer season crops. *P. lanceolata* has tremendous potential for modulating its life cycle strategies in response to diverse ecological stress by acting as "competitor," a "resistor," or a "reactor" [4]. *P. lanceolata* amended soils reduced seed germination, number of nodes, internodes length, shoot and root length, nodule number and weight, and chlorophyll a and b of asparagus bean (*Vigna unguiculata var. sesquipedalis*) [7]. Aqueous leachates of roots of *P. lanceolata* incorporated with soil and rhizosphere, interfered with the seedling growth of certain plant species [12].

This study aims to investigate and document the impact of aqueous extract of dried shoots of *P. lanceolata* on the seed germination of two vegetable crops viz. Okra (*Abelmoschus esculentus* Linn.) and Radish (*Raphanus sativus* Linn.).

MATERIALS AND METHODS

The stock aqueous *P. lanceolata* extract was prepared by soaking 100g of shade dried and finely chopped shoots of *P. lanceolata* in 500ml distilled water for 48 hours. The extract was strained through four layers of cheese cloth

followed by filtration through two layers of Whatman No. 2 filter paper. Various dilutions were obtained by mixing the stock solution and water as given below.

Table. 1: Preparation of *P. lanceolata* shoot aqueous extract

Treatment No.	Dilutions	Stock solution (ml)	Distilled water (ml)
1	Control	00	100.0
2	25%	25.0	75.0
3.	50%	50.0	50.0
4.	75%	75.0	25.0
5.	100%	100.0	00

Twenty five thoroughly washed petri dishes lined with absorbent cotton were autoclaved as per standard procedure at temperature 121^0C with a pressure of 15 psi for 20 min. They were allowed to cool overnight. Okra (Pusa A4) and radish seeds (snow white) were surface sterilized with 2% sodium hypochlorite for 15 min [15]. Twenty seeds of nearly equal size were placed in each petri dish. The control was irrigated with double distilled water. Remaining petri dishes were irrigated with different dilution of *P. lanceolata* extract as outlined in Tab.1. Germination data were recorded at 24 hrs intervals. Emergence of radical is considered as an indicator of germination. Percent germination was calculated as follows.

$$\% \text{ Germination} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds}} \times 100$$

STATISTICAL ANALYSIS

Data was analyzed by one-way analysis of variance (ANOVA) and LSD was calculated at p=0.05 and p=0.01 to test for significance. The analysis was performed with the software R [19].

RESULTS AND DISCUSSION

Seed germination of both vegetable crops was significantly suppressed by all concentration of *P. lanceolata* aqueous extract. Lowest concentration 25% reduced the germination by about 25% in both crops (tab.2, fig.1). A gradual decrease in germination of both crops was observed with increasing concentration of *P. lanceolata* extract. Highest suppression of germination was caused by 100% *P. lanceolata* extract (fig.1). At 25% *P. lanceolata* extract radish showed marginally higher germination. In all remaining treatments okra was found to be more sensitive than the radish. The incorporation of the shoots of *P. lanceolata* in soil had a marked effect on seed germination. Okra seeds showed more germination inhibition results than radish seeds. In Radish at the 4th day stage of seed germination 79.34% reduction was observed at 100% concentration of *P. lanceolata* shoot extracts whereas slightly higher reduction 81.05% was recorded in Okra at 100% concentration level [6,7,9,10]. [13] have reported the inhibition of germination of several plant species by extract of *P. lanceolata*. [14] reported that 40% extracts of *P. lanceolata* and *Imperata cylindrica* reduced germination of *Phalaris minor* by 30 and 35% respectively, while, 30% extract of *Parthenium hysterophorus* completely inhibited germination of *Phalaris minor*. On the other hand 10% extracts of *P. lanceolata* and *Imperata cylindrica* caused 40% inhibition in *Echinocloa colonum.*

Table. 2 – Effect of of *P. lanceolata* extract on the germination of okra and radish seeds.

Plants	Treatments					LSD	
	Control	25%	50%	75%	100%	0.05%	0.01%
Okra	95±3.535	76**±9.617	33**±6.708	21**±5.477	18**±2.828	8.44	11.5
Radish	92±4.472	73**±9.082	59**±4.183	46**±4.183	19**±7.416	8.18	11.1

Mean ±SD

***'*'** Significance at 5% level and **'**'** significance at 1% level.*

'LSD'. Least Significant different

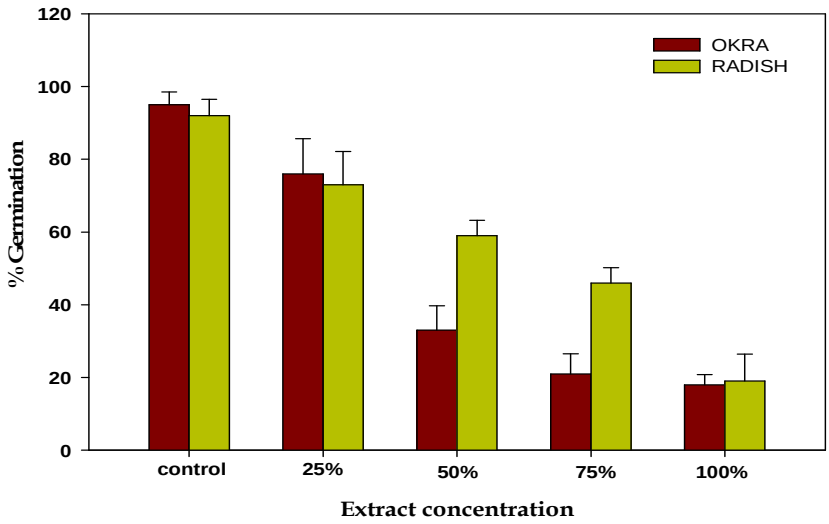

Fig.1 : Effect of *P. lanceolata* extract on the germination of okra and radish seeds

CONCLUSION

Due to the presence of some allelochemicals in *P. lanceolata* it can be concluded that *P. lanceolata* aqueous extract highly suppressed the seed germination of okra and radish. Okra influence greatly by the aqueous extract of *P. lanceolata*.

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