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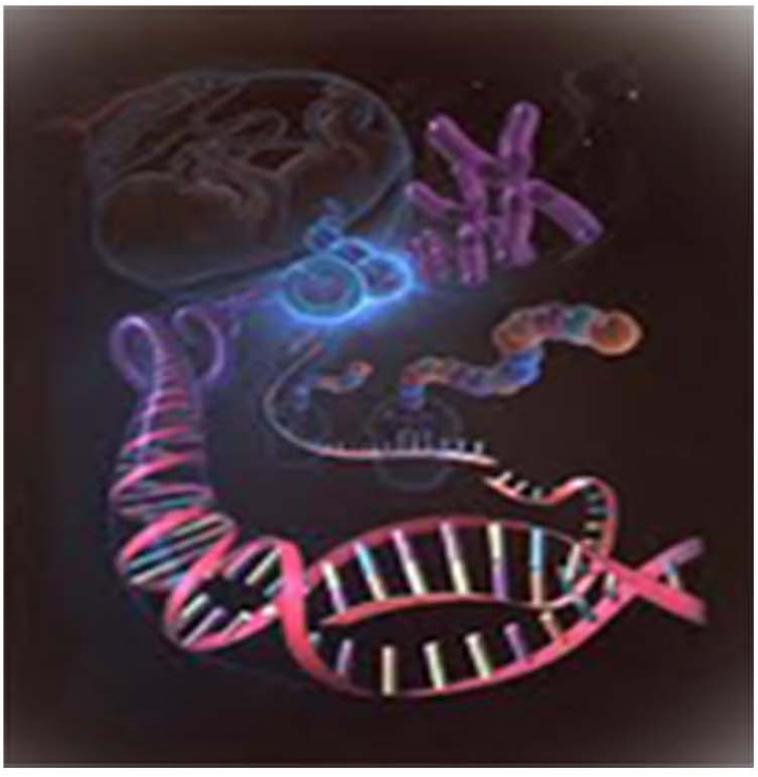

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Research Paper

ALLELOPATHIC EFFECTS OF *CELOSIA ARGENTEA* L. ON SPERMOSPHERE MICROORGANISMS

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Aqueous extracts of root, stem, leaves and flowers of *Celosia argentea* L promoted the growth of spermosphere microorganisms under laboratory conditions. Shoot leachates were actively promotes the growth of spermosphere microorganisms such as *Aspergillus niger, Bacillus subtilis, Fusarium solani* and *Penicillium notatum.* It leads to the production of acids from the microbes into the soil. Hence it is clear that the dormant *Celosia argentea* L seeds will germinate rapidly under acidic conditions. Whereas roots were inhibitory to the growth of *Penicillium* and *Bacillus* species.

Keywords: Spermosphere, Allelopathic effects, *Celosia argentea* L., *Aspergillus niger, Bacillus subtilis*, *Fusarium solani*, *Penicillium notatum*

INTRODUCTION

Spermosphere microorganisms are effected by allelopathic chemicals exudated by weeds and other plants. Rice (1971) and Rice and Pancholi (1972) have observed the inhibitory effect of weeds on nitrogen fixing plants. Effect of *Parthenium hysterophorus* extracts on *Rhizobium* and *Azatobacter* under laboratory conditions was reported by Sarma (1985) and Sarma *et al.* (1988). Allelopathic effects of *Digera muricata* on *Azatobacter* was reported by Sarma *et al.* (1999). Assessment of allelopathy among microbes and plants was studied by Elliot and Cheng (1987). Lovett (1987) studied allelopathic effects through bacterial mediation. Lynch (1987) reported the allelopathy involving microorganisms. These studies were initiated to explore the allelopathic effects of *C. argentea* L. on spermosphere micro-organisms.

MATERIALS AND METHODS

Sterilized conical flasks were taken and 20 mL of PDA medium was distributed into all the conical flasks. Then these conical flasks were divided into four sets.100 mg, 250 mg and 500 mg of root, stem, leaf and flower extracts were weighed. In the first set of conical flasks 100 mg, 250 mg and 500 mg of root extracts were mixed with PDA

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medium separately. Likewise into the 2nd, 3rd and 4th set of conical flasks different quantities of stem, leaf and flower extracts were added respectively. One conical flask containing PDA medium was taken as a control in all the four sets. All the four sets of conical flasks were sterilized by keeping in a autoclave at a pressure of 15 lbs for 30 min. Sterilized petriplates were used. The sterilized media contained 100 mg, 250 mg, and 500 mg of root stem, leaf and flower extracts which were present in the different conical flasks were poured into petriplates separately. In every set one petriplate was taken as a control.

Different fungal species viz., *Aspergillus niger, Fusarium solani, Penicillium notatum,* and *Bacillus subtilis* were isolated from the sphermosphere of *Celosia argentea* were spot inoculated into the root, stem, leaf and flower extracts containing PDA media. Then all the petri plates were incubated for 4 to 5 days. The diameter of each colony of grown microorganism was measured and readings were recorded. Results were statistically analyzed.

RESULTS

Allelopathic Effects of *C. argentea* Stem Extract

The growth of *Penicillium notatum* and *Bacillus subtilis* was increases as the concentration of *C. argentea* stem extract increases (Table 1). But the growth of *Aspergillus niger* and *Fusarium solani* was increased up to 250 ppm of stem extract.

Allelopathic Effects of *C. argentea* Flower Extract

The growth of *Bacillus subtilis* and *Aspergillus niger* was increases as the concentration of *C. argentea* flower extract increases but,

Table 1: The Effect of Stem Extract of *C.argentea* on Various Microorganisms

S.No	Name of the Microorganism	Concentration of Stem Extract (PPM)			
		Control (cm)	100 (cm)	250 (cm)	500 (cm)
1	*Aspergillus niger*	0.5	1.0	1.2	1.0
2	*Bacillus subtilis*	0.7	0.8	0.9	1.0
3	*Fusarium solani*	1.0	3.5	4.0	3.2
4	*Penicillium notatum*	0.6	0.8	1.0	1.1

Note: * Anova analysis: $p<0.000511$.

Table 2: The Effect of Stem Extract of *C.argentea* on Spermosphere Microorganisms

S.No	Name of the Microorganism	Concentration of Stem Extract (PPM)			
		Control (cm)	100 (cm)	250 (cm)	500 (cm)
1	*Aspergillus niger*	0.6	0.8	0.9	1.0
2	*Bacillus subtilis*	0.4	0.6	0.7	0.9
3	*Fusarium solani*	1.0	1.5	2.0	1.0
4	*Penicillium notatum*	0.3	0.5	0.7	0.6

Note: * $p<0.05$ (significant at 5% level).

Penicillium notatum and *Fusarium solani* growth rates increased up to 250 ppm (Table 2).

Allelopathic Effect of *C. argentea* Root Extract

The growth rate of *Fusarium solani* was increases as the concentration of root extract increases but *Aspergillus niger* growth was inhibited with 500 ppm concentration. Whereas root extract inhibited the growth of *Penicillium notatum* and *Bacillus subtilis* (Table 3).

DISCUSSION

The inhibition of nodulation in *Arachis hypogaea* and *Vigna radiata* by the allelopathic effect of

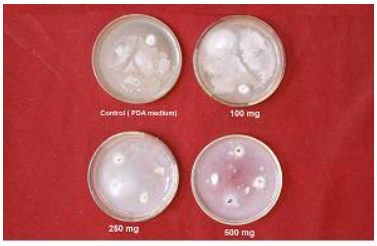
Table 3: The Effect of Root Extract of *C.argentea* on Spermosphere Microorganisms

S.No	Name of the Microorganism	Concentration of Root Extract (PPM)			
		Control (cm)	100 (cm)	250 (cm)	500 (cm)
1	*Aspergillus niger*	0.4	0.6	0.6	0.5
2	*Bacillus subtilis*	0.4	0.3	0.3	0.3
3	*Fusarium solani*	0.3	0.4	0.4	0.5
4	*Penicillium notatum*	0.2	0.1	0.1	0.1

Note: Anova analysis: * $p<0.000511$ (Significant at 5% level).

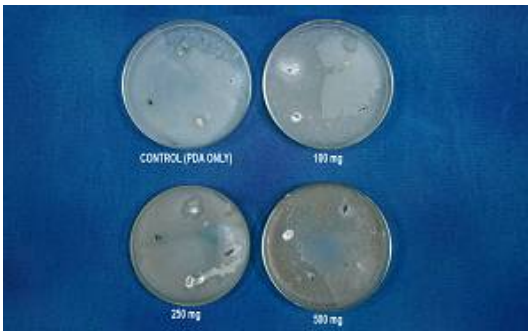
Figure 1: The Effect of *Celosia argentea* L. Plant Extracts on Spermosphere Microorganisms

Leaf extract of **Celosia argentea L.**



Flower extract of **Celosia argentea L.**

Stem extract of **Celosia argentea L.**



Root extract of **Celosia argentea L.**

Digera muricata was reported by Vijayasri *et al.,* (1996). Hence it was thought desirable to study the allelopathic effects of phytoextracts on the growth of microorganisms. In the present study, it is observed that the growth rate of micro-organisms increased as the concentration of *C. argentea* L. shoot leachates increased. But root extracts of *C. argentea* inhibits the growth of certain microorganisms under laboratory conditions. Hence, it may be assumed that the continuous association of *C. argentea* which is a weed in the crop fields may reduce the yield by promoting growth of microorganisms. Seed germinability of *Celosia argentea* L. and its relationship with spermosphere microorganisms was studied by Saritha (2008). Henceforth it clear that the dormant seeds of *Celosia argentea* L. could germinate in acidic conditions of the soil medium released by soil microorganisms in natural soils.

CONCLUSION

By following the above results, present study concludes allelopathic effects of *C. argentea* L. has succeeded in suppressing the yields of cereal crops by promoting the growth of micro-organisms. So it is recommended that the weed *C. argentea* L should be physically removed from crop plant fields before the allelochemicals wash down with the rains.

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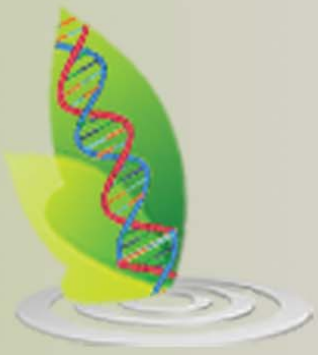

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