

ALLELOPATHIC INFLUENCE OF *PARTHENIUM HYSTEROPHORUS* L. OVER *AMARANTHUS GANGETICUS* AND OVERCOMING TOXICITY

ASHA GUPTA

Department of Life Sciences
Manipur University, Canchipur
IMPHAL - 795003 (MANIPUR) INDIA

ABSTRACT

Aqueous leachate from *Parthenium* plants fed to the seedlings of *Amaranthus gangeticus* was found to be inhibitory for growth. The addition of ammonium sulphate, chromium sulphate, manganese sulphate, sodium sulphate, tannic acid and pyrogalllic acid were capable of detoxication of the injurious substances and promoting growth of the test plant.

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KEY WORDS : Allelopathy, Leachate, Detoxication, Test plant.

Introduction

Many plant species exhibit allelopathy and inhibit the growth of crop plants^(1,2,8). *Parthenium hysterophorus* contains inhibitory substances that are toxic to many organisms⁽⁷⁾. The present study was undertaken to study the allelopathic potential of *P. hysterophorus* on the seedling growth of *Amaranthus gangeticus*, few chemicals were also tried to overcome toxicity.

Materials and Methods

Pots filled with garden soils were divided into five sets of four each. Test plants *Amaranthus gangeticus* were seeded for four days in them. *Parthenium* plants grown in earthen pots of 30 cm diameter and 35 cm depth were drained. Drained leachate was fed to the test plants kept below this assembly for five minutes daily. In the control set, pots without *Parthenium* were used.

In another experiment for overcoming toxicity caused due to *P.hysterophorus*, *Parthenium* leachate plus one of the following chemicals at required concentration was passed over seeded pots of *A. gangeticus*. Besides tap water, *Parthenium* leachate were fed to the test plants as in the above experiment. 10, 25, 50, 100, 250 and 500 ppm of (a) Ammonium Sulphate, (b) Chromium Sulphate, (c) Manganese Sulphate, (d) Sodium Phosphate, (e) Calcium Carbonate, were used.

Tannic acid and pyrogalllic acid were also used separately with tap water in 1:2 w/v ratio. The appearance of seedlings was noted and 25 days old plants were studied for height and dry weights of root and shoot respectively.

Results and Discussion

It was found that aqueous leachate from *P. hysterophorus* inhibited the growth of test plants. It was observed that the *A. gangeticus* plants seeded on the first day were inferior in size than the later sown plants (Table 1).

The *Amaranthus gangeticus* plants grown in pots fed with the drained leachate of *Parthenium* appeared to be in every way inferior to the control plants. The results are attributable exclusively to the allelopathy proving that the aqueous leachate from the *Parthenium* roots had inhibitory effect. It seems that the later planted individuals had to start growth under less toxic conditions with were present in the case of first planted. Considerable amount of phenolic acids at 10 and 20 cm distance from the root system of *P. hysterophorus* were detected⁽⁷⁾ suggesting that the phenolics may be originated from the root system of *P. hysterophorus* plant.

Ammonium sulphate, chromium sulphate, sodium phosphate, tannic acid and pyrogalllic acid had promotory effect on the height and weight of the test plant. These chemicals were capable of

TABLE 1. Effect of leachate from *Parthenium hysterophorus* grown soil on *Amaranthus gangeticus*.

TIME OF SOWING	ROOT		SHOOT	
	DRY WEIGHT (mg)	HEIGHT (cm)	DRY WEIGHT (mg)	HEIGHT (cm)
First day	60 ± 0.80	0.8 ± 0.14	62 ± 11.79	6 ± 0.14
Second day	102 ± 1.13	1.7 ± 0.17	66 ± 0.94	8.7 ± 0.29
Third day	107 ± 1.13	1.8 ± 0.17	69 ± 1.17	10.7 ± 0.24
Fourth day	105 ± 2.13	2.0 ± 0.19	74 ± 2.06	15 ± 0.68
Control	174 ± 2.51	4.0 ± 0.16	120 ± 0.28	24 ± 0.34

TABLE 2. Overcoming of toxicity caused by *Parthenium hysterophorus* on *Amaranthus gangeticus*.

TREATMENTS	CONCENTRATION (ppm)	DRY WEIGHT (mg)	HEIGHT (cm)
(A) Ammonium sulphate	10	124 ± 2.83	22 ± 0.19
	25	139 ± 1.29	21 ± 0.23
	50	126 ± 1.52	24 ± 0.34
	100	153 ± 1.13	25 ± 0.12
	500	273 ± 1.16	28 ± 0.13
(B) Chromium sulphate	10	134 ± 1.16	23 ± 0.19
	25	132 ± 2.82	22 ± 0.25
	50	192 ± 2.04	25 ± 0.17
	100	219 ± 2.28	26 ± 0.17
	500	294 ± 1.96	30 ± 0.31
(C) Maganese sulphate	10	125 ± 1.81	23 ± 0.21
	25	142 ± 1.23	24 ± 0.18
	50	165 ± 2.26	26 ± 0.08
	100	198 ± 1.97	27 ± 0.19
	500	201 ± 2.53	28 ± 0.14
(D) Sodium phosphate	10	135 ± 2.85	21 ± 0.23
	25	156 ± 0.94	25 ± 0.27
	50	195 ± 2.06	25 ± 0.16
	100	210 ± 1.65	26 ± 0.21
	500	275 ± 2.83	29 ± 0.17
(E) Calcium carbonate	10	130 ± 1.81	18 ± 0.16
	25	151 ± 3.46	20 ± 0.23
	50	158 ± 1.26	21 ± 0.17
	100	165 ± 0.80	21 ± 0.27
	500	183 ± 1.36	23 ± 0.28
(F) Tannic acid	1/2 W/V	255 ± 2.74	27 ± 1.0
(G) Pyrogallic acid	1/2 W/V	279 ± 1.29	29 ± 0.13
(H) <i>Parthenium</i> leachate		122 ± 2.08	20 ± 0.11
(I) Control		294 ± 0.94	30 ± 0.23

detoxication of the injurious substances exuded through the roots. For overcoming toxicity, few workers have successfully tried ammonium sulphate to overcome marked injurious effect of the grasses⁽⁴⁾, manganese and chromium salts for oxidising the organic matter and shortening the injurious phase^(5,6), tannic and pyrogallic acids for neutralising the effect of toxic substances both in field and in water culture⁽³⁾.

Parthenium toxins adversely affect the activity of free living and symbiotic nitrogen fixers and

nitrifiers in soil⁽⁷⁾. It appears that the general conditions got improved supplying some sources of energy or/and suitable temperature for the growth of test plants which minimised the toxicity caused due to **P. hysterophorus**. It was found that the inhibition decreased as the concentrations of substances used for detoxication were increased showing clearly that the test plant was affected by the amount of toxic substances. It is also substantiated by the findings that in the later sown test plant, the inhibition was less pronounced.

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