

EFFECT OF PARTHENIUM HYSTEROPHORUS LINN. ON SEEDLING VIGOUR AND YIELD OF SOME LEGUMES/PULSES

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The allelopathic effect of *Parthenium hysterophorus* on the growth and yield of three different legumes viz- Red gram, Green gram and Black gram is evaluated. Aqueous crude extracts of *Parthenium* shoots and roots diluted in different ratios viz-1:1 to 1:20 (crude extract: water v/v) are sprayed on 15 day old seedlings of the different legumes. The response of the three legumes to foliar spraying varied considerably. Aqueous shoot extract in the concentration of 1:10 increased growth by 38% over controls in Red gram and 81% in Green gram. But high concentration of root extract (1:1) and shoot extract (1:3) stimulated vegetative growth of Black gram. The positive allelopathic effects of *Parthenium* on different legumes can be exploited to prepare cheap, eco friendly growth promoting substances.

Keywords: *Parthenium hysterophorus*, Red gram, Green gram and Black gram.

Introduction

Parthenium hysterophorus Linn. (Asteraceae) commonly called as Congress weed has been described as world's worst weed for agriculture, environment and human health¹. The leaves of the plant cause severe dermatitis and the tiny light pollen cause naso-bronchial allergies due to the presence of sesquiterpene-lactone called Parthenin 2. The crop loss due to this plant is immense. In India, the weed causes yield losses of up to 40% in several crops and is reported to reduce production by 90%³. The fight against *Parthenium* using various weapons like herbicides, mechanical uprooting and biological control agents has been lost as the weed continues to increase and spread into remote areas of our country. Manual uprooting is effective but is expensive. Attempts are now being made to utilize the weed profitably. It has been reported that different parts of the plant show different allelopathic effects in crop plants^{4,5}. *Parthenium* has tremendous fecundity and a single plant can produce up to 50,000 flowers thus a very rich source of phytohormones⁶. It is therefore hypothesized that a crude aqueous extract of *Parthenium* would increase the flower production and subsequently yield. The stimulatory effect of foliar extracts of *Parthenium* on growth and yield have been reported in crop plants like chickpea, linseed, kasturi bhendi, rice^{4,5}. An attempt has therefore been made to study the effect of *Parthenium* extract on some legumes like *Cajanus cajan*, *Phaseolus mungo* and *Phaseolus radiatus*.

Material and Methods

Seeds of Red gram (*Cajanus cajan* var. ICPL 85063) obtained from ICRISAT (International Crops Research Institute for the Semi Arid Tropics, Hyderabad), Black gram (*Phaseolus mungo* var IPC-8863) and Green gram (*Phaseolus radiatus* var T-9) purchased from Andhra Pradesh Seed Corporation were used for different experiments in the present study. Healthy vegetative (pre-flowering) and flowering plants of *Parthenium* were collected at random from different localities of Visakhapatnam. An aqueous crude extract was prepared by grinding various parts of *Parthenium* plant like shoot+leaf and roots at a rate of 1gm/ml. The crude extract was filtered through muslin cloth. Aqueous dilute solutions of the crude filtrate were made in the following ratio 1:1; 1:2, 1:10 and 1:20 (crude filtrate: water, v/v).

For pre testing the effect of aqueous *Parthenium* extracts on the germination and seedling vigor of legumes, experiments were carried under controlled conditions in the laboratory in Petridishes. About 20ml of diluted extract was dispensed into glass petridishes lined with filter paper. In each Petri dish 10 seeds were placed equidistantly and 20ml of distilled water was dispensed into the control petridish. The petridishes were incubated at 20 °C and the germination of seeds was recorded five days after incubation (DAI) and the root and shoot length was noted at the end of seven days. All experiments were replicated thrice.

All field experiments were conducted at Gandhi

Table 1. Effect of different concentration of *Parthenium hysterophorus* on Black gram.

		Root Extract				Shoot Extract				
		R ₁	R ₂	R ₁₀	R ₂₀	S ₃	S ₄	S ₅	S ₁₀	S ₂₀
Percentage germination	Treated control	70 100	- -	- -	- -	50 100	50 100	70 90	- -	- -
+ % increase in growth		39.2	-7.14	6.0	0	20	28.5	-7.14	-80.9	-53.5
+ % increase in yield		9.2	51.3	-	-	191.8	90.1	35.7	-	155

+over controls

Table 2. Effect of different concentration of *Parthenium hysterophorus* on Green gram

		Root Extract				Shoot Extract				
		R ₁	R ₂	R ₁₀	R ₂₀	S ₃	S ₄	S ₅	S ₁₀	S ₂₀
Percentage germination	Treated control	80 100	80 100	- -	- -	60 90	60 100	70 90	- -	- -
+ % increase in growth		22.3	-4.8	-	-	23.0	22.7	4.5	81	66.6
+ % increase in yield		44.4	-	-	-	16.6	-	87.5	-	-

+over controls

Table 3. Effect of different concentration of *Parthenium hysterophorus* on Red gram

		Root Extract				Shoot Extract					
		R ₁	R ₂	R ₁₀	R ₂₀	S	S ₃	S ₄	S ₅	S ₁₀	S ₂₀
Percentage germination	Treated control	100 100	100 100	100 100	- -	- -	100 100	100 100	- -	- -	- -
+ % increase in growth over controls		-1.08	-22.8	4.83	-80	45	0.2	-33.8	7.09	38.6	15.6

- S 1:0 Crude shoot+leaf extract of *Parthenium*
 S1 1:1 Dilution of shoot+leaf extract of *Parthenium*
 S2 1:2 Dilution of shoot+leaf extract of *Parthenium*
 S10 1:10 Dilution of shoot+leaf extract of *Parthenium*
 S20 1:20 Dilution of shoot+leaf extract of *Parthenium*
 R Crude Root extract of *Parthenium*
 R1 1:1 Dilution of root extract of vegetative plants
 R2 1:2 Dilution of root extract of vegetative plants
 R10 1:10 Dilution of Root extract of *Parthenium*
 R20 1:20 Dilution of Root extract of *Parthenium*

Institute of Technology and Management (GITAM) College campus. The experimental field is a sandy loam having good drainage. The field was thoroughly tilled and beds of 1m×0.5m were prepared and 20kgs of farmyard manure + vermi compost was added to each bed. Healthy, uniform sized seeds were sown in 3 rows in each bed. Seed beds were irrigated every day in the morning and on every second day after the germination of seeds. Healthy seeds were washed thoroughly with tap water to remove debris on the surface and were planted equidistantly in a randomized plot design.

Results and Discussion

The results of the effect of extracts of *Parthenium* on the growth and yield of Black gram, Green gram and Red gram were tabulated in (Tables 1-3). It is evident from the tables that three legumes differed considerably in their response to spraying.

Extracts of *Parthenium* did not effect seed germination in Red gram, but did inhibit (20%) germination in Black and Green gram in the laboratory experiments.

Root extract enhanced the vegetative growth in Blackgram and Red gram while shoot extract performed better in improving the growth of Green gram.

In Black gram root extract was found to be more stimulatory (40%) than shoot extract at 1:1 concentration and shoot extract at 1:3 and 1:4 concentrations increased shoot length by 30% and yield by 191% over the controls (Arunalakshmi, APCOST, 2002).

Highly diluted shoot extract (1:10) stimulated vegetative growth of Green gram by 81% over controls. However further dilutions were found to inhibit shoot growth. Root extract of *Parthenium* showed less stimulatory effect. High concentrations of shoot extract (S1-S5) inhibited vegetative growth but had a positive effect on the yield of the Green gram. In totality S5 treatment showed maximum yield (87%) over controls.

In Red gram hundred percent of the seeds germinated and there was no difference in germination between treatments and control. Crude extract of the root had the greatest inhibitory effect reducing the growth by 75-78% compared to the controls. Dilution 1:1 and 1:2 also reduced growth than in controls and showed an inhibitory or phytotoxic effect. Shoot extract diluted to 1:10 had a stimulatory effect on shoot growth (38.6%) of *Cajanus*. The root extract at a dilution of 1:20 showed maximum growth (45%) than controls. Although not significant, *P. hysterophorus* extracts were found to increase plant height and leaf size of *Cajanus* over their controls. The leaves of the treated plants were dark green in color over their controls. This suggests that the allelochemicals present in the extract

had not effected or interfered with the germination and vegetative growth of *Cajanus*.

The factor promoting or inhibiting growth in the crude extract has not been quantified or characterized. Such studies would probably throw more light on the precise mechanism involved in allelopathy. The positive allelopathic effects of *Parthenium* on black gram can be exploited to prepare a cheap, ecofriendly growth promoting substance. The weed can profitably utilized as a potential source of growth promoters, which is a very useful product from the standpoint of a farmer.

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