

Lantana camara Leaves: An Important Source of Allelochemicals

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Abstract

Allelopathy may provide alternatives to synthetic herbicides for weed control. Allelopathy is a unique, natural and an environment-friendly technique that may be used for weed control. Lantana camara has allelopathic properties which effect in the germination and growth of surrounding plants. The aqueous leaf extract of L. camara was found to have inhibitory effect on germination of Parthenium hysterophorus. The results indicated that the inhibitory effect was much more pronounced at higher concentrations.

Keywords: allelochemical, allelopathy, germination, *Lantana camara*

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INTRODUCTION

Lantana camara is a notorious weed belonging to verbenaceae family. It is native to tropical and subtropical America and popular ornamental garden plant. *Lantana camara* grows under varying conditions of climate and soil and commonly known ach man, big sage, lantana, flowered sage.

Allelopathy term refers to all biochemical interactions (stimulatory and inhibitory) among plants, including microorganisms. Allelon means each other and Pathos means to suffer, the term refers to effects that are both detrimental and beneficial among the interacting organisms. Allelochemicals of *Lantana* have already been isolated and documented by many scientists.

Allelochemicals are present in leaves, stem, roots and flowers of *Lantana* but leaves are the major source of allelochemicals.^[1] Yi *et al.*,^[2] reported the presence of several phenolic compounds in lantana leaf extract identified by HPLC as salicylic, gentisic, β -resorcylic acid,

vanillic, caffeic, ferulic, phydroxybenzoic acids, coumarin and 6- methyl coumarin. Leaf extract of *Lantana camara* had greater inhibition on the germination of *Phaseolus mungo* as compared to the extracts of stem and root.^[3]

Parthenium hysterophorus is a member of the Asteraceae family. It has several synonyms like fever few, congress weed, star weed, carrot weed, white cap, white top, naxalite weed, etc. It is problematic weed in Indian agricultural productivity. *Parthenium* is not only harmful to crop plants, but can also have a negative impact on human health, as it may cause asthma, contact dermatitis and hay fever.

The beneficial allelopathic effect of any weed or crop on another weed can be exploited to prepare ecofriendly, cheap and effective green herbicides. The allelochemicals has potential in the design and development of new herbicides. The ability of some natural plants compounds to effectively inhibit the development of other plant has suggested that they may be used as herbicides.^[4]

In the present investigation, an effort was made to study the extracts of leaf, stem and root of *Lantana camara* inhibited the seed germination of *Parthenium hysterophorus* clearly indicated that the allelochemicals present in the extracts adversely affected the seed germination.

MATERIALS AND METHOD

One hundred gram each of leaf stem and root chopped in small pieces and crushed in the mixture glider. One hundred gram each of leaf stem and root was soaked in 150 mL double distilled water for 24 hours. The extract of each specimen was filtered with ordinary filter paper. A total of 98 mL of double distilled water was added to 2 mL of extract to make 2% solution. Similarly all the concentrations (2, 5, 10, 20, 15, 25, 30, 40 and 50%) were prepared by adding appropriate amount of double distilled water.

Seeds of *Parthenium hysterophorus* were thoroughly washed under tap water to get rid of dirt and dust, and rinsed with a mild detergent solution for 5 min. The seeds were then surface sterilized with 0.1%

HgCl₂ for 10 min and re-washed 4–7 times with sterilized distilled water.

The germination test was carried out in sterile petri-dishes of 12 cm in size placing a Whatman (number 3) filter paper on petri-dishes. The extract of each concentration (leaf, stem and root extract of *Lantana camara*) was added to each petri-dish of respective treatment daily in such an amount just enough to wet the seeds. The controls were treated similarly with distilled water. 75 seeds were spread in containing Whatman's filter paper petri-dish.

The petri-dish was set in the four replications. The treatments were kept in randomized design with laboratory of the M.G.C.G.V., Chitrakoot at room temperature ranging from 28 to 35 °C.

The germination was recorded daily and the results were determined by counting the number of germinated seeds. Observations were recorded on 4th, 7th, 10th, 13th, 16th and 19th day.

Table 1. Effect of *Lantana camara* Leaf, Stem and Root Extracts on Seed Germination Percentage of *Parthenium hysterophorus* on 4th, 7th, and 10th day.

Concentration (%)	4 day			7 day			10 day		
	LLE	LSE	LRE	LLE	LSE	LRE	LLE	LSE	LRE
Control	36	36	36	42.66	42.66	42.66	49.33	49.33	49.33
2%	1.33 (-96.30)	4 (-88.88)	5.33 (-85.19)	4 (-90.62)	6.66 (-84.38)	9.33 (-78.12)	9.33 (-81.08)	13.33 (-72.97)	17.33 (-64.86)
5%	0	1.33 (-96.30)	2.66 (-92.61)	2.66 (-93.76)	4 (-90.62)	5.33 (-87.50)	6.66 (-86.49)	9.33 (81.08)	13.33 (-72.97)
10%	0	0	1.33 (-96.30)	1.33 (-96.88)	2.66 (-93.76)	4 (-90.62)	4 (-91.89)	6.66 (86.49)	10.66 (-80.01)
15%	0	0	0	0	1.33 (-96.88)	2.66 (-93.76)	2.66 (-94.60)	4 (-91.89)	9.33 (-81.08)
20%	0	0	0	0	0	1.33 (-96.88)	0	2.66 (-94.60)	5.33 (-89.19)
25%	0	0	0	0	0	0	0	1.33 (-97.30)	2.66 (-94.60)
30%	0	0	0	0	0	0	0	0	1.33 (-97.30)
40%	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0

Values in the Parenthesis Indicate the Inhibitory (–) Effects in Comparison to Control Treatment. LLE: Lantana Leaf Extract; LSE: Lantana Stem Extract; LRE: Lantana Root Extract.

RESULT AND DISCUSSION

Percentage seed germination of *Parthenium hysterophorus* were delayed and inhibited or reduced significantly by the varied concentrations of leaf, stem and root aqueous extracts of *Lantana camara*. Variation of the germination percentage varied evenly due to different concentrations. With the increase of concentration, the inhibitory effect was progressively increased. Results revealed that aqueous extracts of leaf, stem and root of *Lantana camara* caused significant inhibition on the germination behavior of

Parthenium seeds. The process of germination decreased as the concentration increased in the medium. On the 4th days some of the ungerminated seeds start germination.

Significant difference for percent seed germination delay and inhibited or reduce in leaf, stem and root extract of *Lantana camara* was recorded after 4, 7, 10, 13, 16 and 19 days as shown in Tables 1, 2. Comparative details of germination are given in Figure 1.

Table 2. Effect of *Lantana camara* Leaf, Stem and Root Extracts on Seed Germination Percentage of *Parthenium hysterophorus* on 13th, 16th and 19th day.

Concentration(%)	13 th day			16 th day			19 th day		
	LLE	LSE	LRE	LLE	LSE	LRE	LLE	LSE	LRE
Control	56	56	56	62.66	62.66	62.66	69.33	69.33	69.33
2%	12 (-78.57)	18.66 (-66.67)	24 (-57.14)	13.33 (-78.72)	22.66 (-63.83)	29.33 (-53.19)	13.33 (-80.77)	25.33 (-63.46)	33.33 (-51.92)
5%	8 (-85.71)	13.33 (-76.19)	18.66 (-66.67)	8 (-87.23)	16 (-74.46)	22.66 (-63.83)	8 (-88.46)	17.33 (-75.00)	25.33 (-63.46)
10%	4 (-92.85)	9.33 (-83.33)	14.66 (-73.82)	4 (-93.61)	10.66 (-82.98)	17.33 (-72.34)	4 (-94.23)	10.66 (-84.62)	18.66 (-73.08)
15%	2.66 (-95.25)	5.33 (-90.48)	13.33 (-76.19)	2.66 (-95.75)	5.33 (-91.49)	14.66 (-76.60)	2.66 (-96.16)	5.33 (-92.31)	14.66 (-78.85)
20%	0	2.66 (-95.25)	8 (-85.71)	0	2.66 (-95.75)	8 (-87.23)	0	2.66 (-96.16)	8 (-88.46)
25%	0	1.33 (-97.62)	4 (-92.85)	0	1.33 (-97.87)	4 (-93.61)	0	1.33 (-98.08)	4 (-94.23)
30%	0	0	1.33 (-97.62)	0	0	1.33 (-97.87)	0	0	1.33 (-98.08)
40%	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0

Values in the Parenthesis Indicate the Inhibitory (–) Effects in Comparison to Control Treatment. LLE: *Lantana* Leaf Extract; LSE: *Lantana* Stem Extract; LRE: *Lantana* Root Extract.

On the basis of observation recorded, it is evident that percentage of seed germination was higher in control. Aqueous leaf extract of *Lantana camara* inhibit maximum seed germination followed by stem and root i.e., allelochemicals are present in increasing order i.e., root > stem > leaf extract. However, with increase in concentration, percentage of seed germination was decreased inhibition increased with the

increase in the concentration of *L. camara* leaf, stem and root extract, respectively.

Seeds imbibed in aqueous extracts of leaf, stem and root of *Lantana camara* showed inhibition in seed germination. It is evident from the data that allelochemicals present in *L. camara* might inhibit the process of seed germination. The probable reason of inhibition may be the presence of higher concentration of allelochemicals in the leaf extract than that of stem and root extract.

Many allelochemicals are present in *Lantana* such as B-pinene, Cinnamic acid, 1,8-Cineole, Dipentene, Ferulic acid, Palmitic acid, p-Coumaric acid, Myristic acid, p-hydroxybenzoic acid and Vanillic acid which inhibit the process of seed germination and plant growth (Mishra, 2014 and Sampietro, 2003).^[5,6]

The different concentration of aqueous leaf extracts of *Lantana camara* caused significant inhibitory effect on germination and growth of *Pistum sativum*, *Trigonella foenum-graceum*, *Cucumis sativus* L., *Cicer arietinum* L., *Phaseolus mungo*, *Vigna unguiculata* and *Parthenium hysterophorus*.^[7-11]

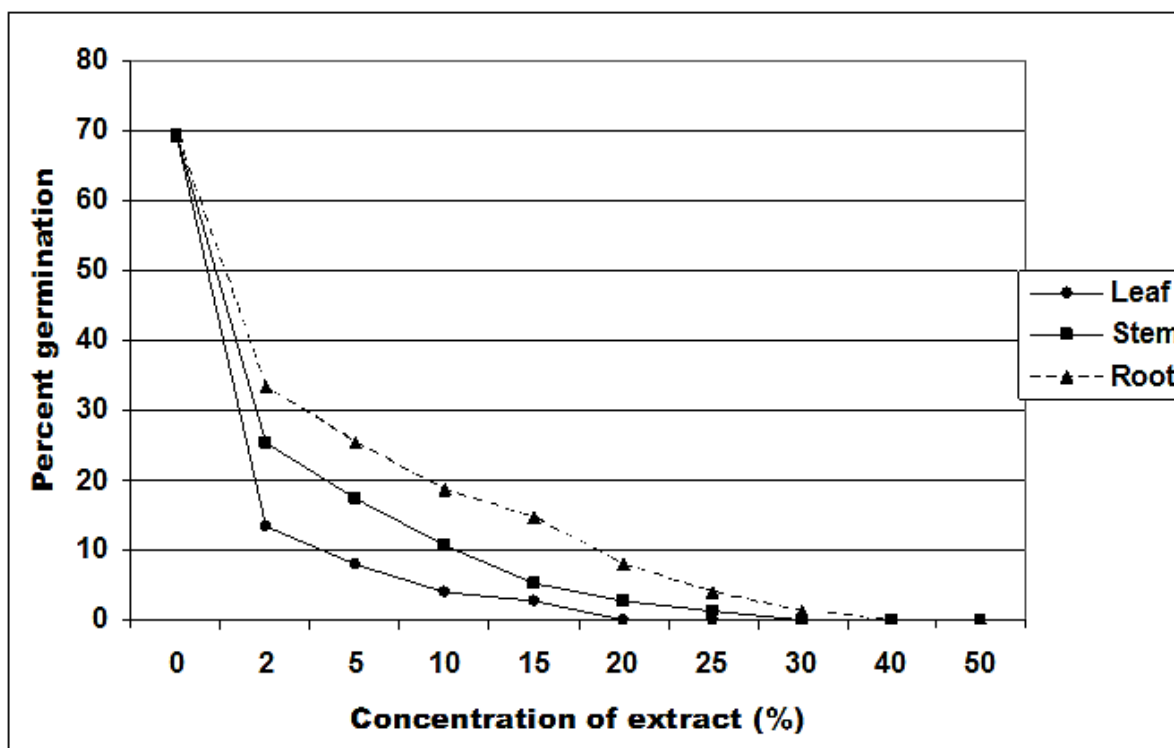


Fig. 1. Effect of Different Concentration of Leaf, Stem and Root Extracts of *Lantana camara* on Seed Germination of *Parthenium hysterophorus* as Observed After 19 days.

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