



ALLELOPATHY: NATURAL AND AN ENVIRONMENT-FRIENDLY UNIQUE TOOL FOR WEED CONTROL

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Abstract: Allelopathy term refers to all biochemical interactions (stimulatory and inhibitory) among plants, including microorganisms. Allelopathy is derived from the Greek words allelon “of each other” and pathos “to suffer”. The current study was conducted to test the inhibitory potential of aqueous extracts of four plant species (*Lantana camara*, *Calotropis procera*, *Amaranthus viridis* and *Datura stramonium*) on seed germination of *Parthenium hysterophorus*. Leaf extract of *Lantana camara* were highly effective in reducing the germination of *Parthenium hysterophorus* followed by *C. procera* *D.stramonium* *A. viridis*.

Key words: Allelopathy, *Parthenium hysterophorus*, Germination

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INTRODUCTION

Allelochemicals refer mostly to the secondary metabolites produced by plants and are byproducts of primary metabolic processes. Allelopathy can be regarded as a component of biological control in which plants are used to reduce the vigour and development of other plants. Many of these compounds are phytotoxic and have potential as herbicides or as templates for new herbicides classes. These allelochemicals offer great potential for pesticides because they are free from problems associated with present pesticides.

Weeds are unwanted, undesirable and non economic plants that compete with crops for water, nutrients, and sunlight. Additionally, some weeds interfere with crop plants through allelochemicals which inhibit crop growth and development. Weeds pour serious problem to farmers throughout the world reducing yield and quality of crops. Crop losses from weeds worldwide average 10% annually. The origin of *Parthenium* dates back to 4th century BC in the Greek city of Parthenia.. Water soluble phenolics and sesquiterpene lactones have been reported from the roots, stems, leaves, inflorescences, pollen and seeds of this plant (Rajan, 1973). It was distributed throughout the world along with wheat. *Parthenium* may cause allergic, dermatitis, hay fever, rhinitis, and respiratory problems as asthma, bronchitis in sensitive human and animals (Evans, 1997). *Lantana camara* is one of the ten worst weeds of the world and is serious weed in 14 crops in 47 countries. Allelochemicals are present in leaves, stem, roots and flowers of *Lantana* but leaves are the major source of allelochemicals.

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. Allelopathy is a natural and an environment-friendly technique which may prove to be a unique tool for weed control, increase crop yields, decrease our reliance on both synthetic pesticides and improve the ecological environment. The objective the present study was to assess the potential of aqueous leaf extract of four plant species viz. *Lantana camara*, *Calotropis procera*, *Amaranthus viridis* and *Datura stramonium* to control the germination of *Parthenium hysterophorus*.



MATERIALS AND METHOD

Fresh plant materials of *Lantana camara*, *Calotropis procera*, *Amaranthus viridis* and *Datura stramonium* were collected from university campus M.G.C.G.V, Chitrakoot. Satna(M.P.)

The leaves were detached and washed with distilled water to remove the adherent dust particles. Aqueous extract of leaves was prepared as under 200g of fresh leaves chopped in small pieces and crushed in the mixture grinder after grinding the material of leaf were soaked in 1000 ml of distilled water for 24 hour, the aqueous extract was filtered through the muslin cloth and then some of the extract was diluted to make the concentrations to 10% (T₁), 25% (T₂), 50% (T₃), 75% (T₄), 100% (T₅) (on the basis of volume) and distilled water as a control (T₀) treatment.

The seeds were surface sterilized with 0.1% HgCl₂ for 10 min and again washed with sterilized distilled water 4-7 times. The germination test was carried out in sterile Petri dishes of 12 cm in size placing a whatman number 3 filter paper on petridishes. The extract of each concentration was added to each petridish of respective treatment daily in such an amount just enough to wet the seeds. The controls were treated similarly with distilled water. Twenty seeds were spread in containing whatman's filter paper petri dish. The petri dish were set in the four replications. The treatments were kept in randomized design with laboratory of the M.G.C.G.V, Chitrakoot(M.P.) at room temperature ranging from 30-35⁰C. The experiment was extends over a period of 10days to allow the last seed germination. The germination was recorded on daily basis. Data were recorded on counting the number of germinated seeds .

RESULT AND DISSECTION

Percentage seed germination of *Parthenium hysterophorus* were delayed and inhibited or reduced significantly by the varied concentrations of leaf aqueous extracts of different plant species. Variation of the germination percentage varied evenly due to different concentrations. With the increase of concentration, the inhibitory effect was progressively increased.

The process of germination decreased as the concentration increased in the medium. The maximum percentage of seed germination was observed in control 100%. It is evident from



the observations that there was complete inhibition of germination of seed more than in 25% to 100% concentration of aqueous leaf extract of *L.camara* .

Leaf extract of *Lantana camara* were highly effective in reducing the germination of (*Parthenium hysterophorus*) followed by *C. procera* *D.stramonium* *A. viridis*. Significant difference for percent seed germination delay and inhibited or reduce was recorded 10 days as shown in Table 1 and 2.

Table 1. Effect of leaf aqueous extract concentration of four weed species on germination percentage of *Parthenium hysterophorus*.

Concentration In %	<i>L.camara</i>	<i>C. procera</i>	<i>D.stramonium</i>	<i>A. viridis</i>
T ₀	100	100	100	100
T ₁	10	60	65	78
T ₂	00	56	60	67
T ₃	00	42	48	56
T ₄	00	30	33	45
T ₅	00	16	20	27

Table 2. Effect of leaf aqueous extract concentration of four weed species on germination percentage inhibition of *Parthenium hysterophorus*.

Concentration In %	<i>L.camara</i>	<i>C. procera</i>	<i>D.stramonium</i>	<i>A. viridis</i>
T ₀	00	00	00	00
T ₁	90	40	35	22
T ₂	100	44	40	33
T ₃	100	58	52	44
T ₄	100	70	67	55
T ₅	100	84	80	73

Seeds imbibed in aqueous leaf extracts of *L. camara*, *C. procera*, *D.stramonium* and *A. viridis* showed inhibition in seed germination. It is evident from the data that allelochemicals present in these plant species might inhibit the process of seed germination.

Leaf extract was found to exhibit maximum allelopathy followed by stem, flower and fruit extracts (Mishra & Singh, 2010). The allelopathic effects of aqueous extracts of leaf and reproductive organs (flower and fruit) of *L. camara* on seed germination of radish and lettuce (Qiaoying *et al*, 2009). The significant effect of *Lantana camara* leaf extract on



germination of *Melilotus alba* which recorded the lowest germination, lower than the control (Oudhia, 2000).

Percentage seed germination of Fenugreek and *Pistum sativum* were inhibited or reduced significantly by the varied concentrations of leaf aqueous extracts of *Lantana camara*. (Mishra, 2010) Yi *et al.*, (2005) 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. Lantadene A and lantadene B as more potent allelochemicals.

In the present investigation, thus concludes that all the concentrations of leaf aqueous extract of *L. camara*, *C. procera*, *D.stramonium* and *A. viridis* can be used as a green herbicides.. Therefore the of which are used by the farmers in traditional practices . Phytotoxic compounds (allelochemicals) of different plant species has potential in the design and development of new herbicides. Moreover, herbicides cause environmental pollution, unsafe agricultural products and human health concerns. Due to the importance of sustainability, modern agriculture searches for new compounds which are environmentally friendly and challenges to reduce environmental damages and healthy hazards due to chemical inputs, minimizes soil erosion, and yet maintains a high level of production.

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