Phytotoxic Effect of Lantana Camara Leaf Extract on Germination and Growth of Pistum Sativum

Introduction
The term allelopathy was coined by Molish (1937) to refer to biochemical interactions among all kind of plant, including microorganisms. He referred that the term allelopathy is meant to encompass both inhibitory and stimulatory biochemical interactions. Allelochemicals are present in plant roots, rhizomes, stems, leaves, flowers, inflorescence, pollen, fruits and seed but leaves are the major sources of allelochemicals. Some allelochemical induced changes in germination behavior and growth parameters of target species (Chaudhary and Agarwal (2002) and Maiti et al. (2008). Vijay and Jain (2010) reported that Lantana camara is a noxious weed causing serious threat to the biodiversity. Lantana camara is a significant weed of which there are some 650 varieties in over 60 countries. It is established and expanding in many regions of the world. Lantana camara is a notorious, noxious and invasive weed belonging to verbenaee family. Lantana camara is one of the ten worst weeds of the world, which is a native of tropical and subtropical America.

Pea (Pisum sativum L.) is an annual herb belonging to Fabaceae family. It is self pollinated, stem weak, alternate leaves and terminal branched tendrils leaflets ovate or elliptic. Peas are cultivated for the fresh green seeds, tender green pods, dried seeds and foliage in the temperate region of the world and as winter crop in sub-tropics.

Therefore, in the present study an attempt was made to study the inhibitory effect of L.camara leaf extract on seed germination and growth of Pisum sativum.

Materials and Methods
The leaves were detached and washed with distilled water to remove the adherent dust particles. Aqueous extract of L.camara 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 for 24 hour, the aqueous extract was filtered 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.

Experiments of the present investigation were carried out with fully viable healthy seeds of Pistum sativum as bioassay material. 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 similar with distilled water. Twenty seeds were spread in containing whatman’s filter paper petri dish. The petridish were 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 10-150C. The experiment was extends over a period of 6 days to allow the last seed germination. The germination was recorded on daily basis.

Data were recorded on counting the number of germinated seeds and lengths of root and shoot.

Result and Discussion
Effect on germination
Percentage seed germination of Pistum sativum were inhibited or reduced significantly by the varied concentrations of leaf 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.

The maximum percentage of seed germination was observed in control (T0) 100%. In 10% (T1) concentration of Lantana camara aqueous leaf extract was observed 90% germination over control. T2 treatment germination were observed 85%, T3 treatment germination were observed 75% and in T4 treatment germination were observed 50% over control. Minimum percentage 30% germination was recorded in T5 treatment.

Table. 1. Effect of L.camara leaf extract on germination and seedling growth of Pistum sativum at 6th day after sowing.

| Treatment | % Germination | Shoot length (cm) | Root length (cm) | Vigor index | % Inhibition in Germination | % Inhibition in Shoot length | % Inhibition in Root length |
|-----------|---------------|-------------------|-----------------|-------------|-----------------------------|-----------------------------|-----------------------------|
| T0        | 100           | 2.7               | 5.3             | 800         | -                           | -                           | -                           |
| T1        | 90            | 1.7               | 3.8             | 495         | 10                          | 37.04                       | 28.31                       |
| T2        | 85            | 1.4               | 2.5             | 365.5       | 15                          | 48.15                       | 45.29                       |
| T3        | 75            | 0.9               | 2.2             | 232.5       | 25                          | 66.67                       | 58.5                        |
| T4        | 50            | 0.6               | 1.3             | 95          | 50                          | 77.78                       | 75.48                       |
| T5        | 30            | 0.4               | 0.6             | 30          | 70                          | 85.19                       | 88.68                       |
Effect on seedling growth

According to the result recorded in table-1 the different concentration of aqueous leaf extract of Lantana camara had significant effect on shoot and root length of seedling Pistum sativum. Plant shoot and root length were decrease over control with the increasing concentration of extract. Maximum growth of shoot and root were observed in control (T0). Maximum inhibition of shoot and root length were observed 85.19% and 88.68% respectively in T5 treatment. In T1 treatment the plant growth were observed 77.78% inhibited in shoot and 58.5% inhibited in root over control. In T2 treatment the plant growth were observed 66.67% inhibited in shoot and 45.29% inhibited in root over control. In T3 treatment the plant growth were observed 48.15% inhibited in shoot and 45.29% inhibited in root over control. In T4 treatment the plant growth were observed 37.04% inhibited in shoot and 28.31% inhibited in root over control. In T5 treatment the plant growth were observed 18.18% inhibited in shoot and 12.12% inhibited in root over control.

The inhibition in seed germination was due to allelochemicals, particularly, phenolics (Kaur et al. 1999) and other secondary metabolites like growth regulators, alkaloids (Overland 1966), terpenoides (Miller et al 1968) and toxins which are present in various plant parts and are released into the environment through volatilization, leaching, root exudation and decomposition of plant residues. It is evident from the data that allelochemicals present in L. camara might inhibit the process of seed germination. Lantana camara leaf, stem and root contain some harmful allelochemicals, which inhibited the germination of Funaria hygrometrica (Choyal, R and Sharma, S. 2011). The probable reason of inhibition may be the presence of allelochemicals. 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. The extracts of Lantana camara differ-

cent parts such as leaf, stem, flower and fruit inhibited growth of Parthenium hysterophorus. Leaf extract of Lantana camara inhibited early growth control followed by stem and flower (Mishra, A and Singh, R. 2009). The water soluble allelochemicals of Lantana camara inhibited the initial growth of both the agricultural (Oryza sativa, Triticum aestivum, Vigna sinensis, Cucurbita pepo, Abelmoschus esculentus, Amaranthus tri-color and forest crops (Acacia auriculiformis, Paraserianthes falcatoria, Albizia procera) in the laboratory conditions (Hossain & Alam, 2010). The growth of the aquatic weed Eichhornia crassipes and the alga Microcystis aeruginosa may be inhibited by fallen leaves of Lantana camara. The extracts of Lantana camara leaves and their fractions reduced the biomass of Eichhornia crassipes and Microcystis aeruginosa within 7 days under laboratory conditions (Kong et al. 2006). These chemicals interfere with various physiobiochemical processes of seed germination, root elongation, plant growth as well as various metabolic activities of many species.

In the present investigation, thus concludes that all the concentrations of leaf aqueous extract of L. camara reduced the germination and growth Pistum sativum. Hence the fast growing exotic weed L.camara having inhibiting properties should be treated as a potential threat to plant diversity in a natural ecosystem.

Fig. inhibitory effect of Lcamara leaf extract on seedling growth of Pistum sativum.

![Image](image_url)

**Reference**

Choyal, R and Sharma, S. (2011). Allelopathic Effects of Lantana camara (Linn) on regeneration in Funaria hygrometrica. Indian Journal of Fundamental and Applied Life | Sciences 1 (3): 177-182. | Chaudhary, BL & Agarwal, N (2002). Inhibitory effect of Lantana camara extract on spore germination of Plagiochasma appendiculatum Lehm and Lindemb. J. Indian Bot. Soc. 81: 309-312. | Kong, C.H., Wang, P., Zhang, C.X., Zhang, M.X. and Hu, F. (2008). Herbicidal potential of allelochemicals from Lantana camara against Eichhornia crassipes and the alga Microcystis aeruginosa. Weed Research 46 (4): 290-295. | Kaur A.Pant AK and Rao PB 1999. Allelopathic effect of four agroforestry tree species on seed germination and seedling growth of certain varieties of wheat. Indian J Ecol 26 (2): 125-135. | Maili, PP; Bhakat, RK & Bhattacharjee, A (2008). Allelopathic effects of Lantana camara on physio-biochemical parameters of Mimosa pudica seeds. Allelopathy J. 22: 59-68. | Miller HE Mabry TJ Turner BL and Payne WW 1968. Intraspecific variation of sesquiterpene lactones in Ambrosia psilostachya. J Am J Bot 55: 316-324. | Mishra, A and Singh, R. (2005). Allelopathic effect of Lantana camara extract of different parts on growth of Parthenium hysterophorus L. Flora and Fauna 15(2): 264-266. | Molish, H (1937). Der Einflusse einer Pflanze auf die andere. Allelopathic. Fisher. Jena. | Overland L. 1966. The role of allelopathic substances in the ‘smother crop’ barley Am J Bot 53: 423-432. | Yi Z., Zhang M., Ling B., Xu D and Ye, J. (2005). Inhibitory effects of Lantana camara and its | contained phenolic compounds in Eichhornia crassipes growth. Journal of applied ecology 17: 1637-1646. | Hossain, MK & Alam, NMD (2010). Allelopathic effects of Lantana camara leaf extract on germination and growth behavior of some agricultural and forest crops in Bangladesh. Pak.J.Weed Sci Res. 16(2): 217-226. | Vijay, B & Jain, BK (2010). Allelopathic effects of L. camara L. on in vitro seed germination of Phaseolus mungo. International Journal of plant sciences. 5 (1): 43-45.