

## Phytotoxic Effect of *Lantana Camara* Leaf Extract on Germination and Growth Behavior of *Trigonella Foenum-Graceum L*



### Botany

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### ABSTRACT

The current study showed that water soluble allelochemicals of *L. camara* inhibit the germination and initial growth of fenugreek (*Trigonella foenum-graceum L.*) under laboratory conditions. Allelochemicals play major role in influencing the crop productivity through inhibitory or stimulatory interaction. Different concentrations i.e. 10%, 25%, 50%, 75% and 100% of leaf extract of *L.camara* showed inhibitory effect on germination, root and shoot elongation of fenugreek.

### Introduction

*Lantana camara L.* is a large scrambling evergreen shrub which is commonly called as wild sage and *lantana* weed. *Lantana camara L.* is an invasive weed that is wide spread in India (Arvind et al., 2010). *Lantana camara L.* is a noxious weed belonging to Verbenaceae family which comprises of about 650 species spread over 60 countries. *Lantana* has allelopathic potential and contains some water soluble phytotoxins (Sahid and Sugau, 1993). Yi et al., (2005) reported the presence of several phenolic compounds in *lantana* leaf extract identified by HPLC as salicylic, gentisic,  $\beta$ -resorcylic acid, vanillic, caffeic, ferulic, hydroxybenzoic acids, coumarin and 6- methyl coumarin. The weed is aggressively growing in forest, agriculture, tea garden and wastelands of all over the country (Ahmed, 1997). Weeds species are considered as rich source of secondary metabolites (allelochemicals) and these chemicals modify the environmental system on other plants growing in their vicinity and the phenomenon is known as allelopathy (Nandal et al., 1994).

Fenugreek (*Trigonella foenum-graecum L.*) is a self pollinated, small-seeded annual legume (family Leguminosae) that is grown as a spice and a forage crop. Fenugreek has two areas of origin: the Indian sub-continent and the Eastern Mediterranean Region. The seeds of fenugreek contain lysine and Ltryptophan rich proteins, mucilaginous fiber and other rare chemical constituents such as saponins, coumarin, fenugreekine, nicotinic acid, saponin, phytic acid, scopoletin and trigonelline (Bukhari et al., 2008). In India, the seeds are used in curries, dyes, and medicines, and young seedlings are often eaten as a vegetable. In Europe and North America, the seed is used for its pharmaceutical qualities, as a spice, as an imitation maple, vanilla, rum or butterscotch flavouring, and in health food.

Therefore, in the present study an attempt was made to study the allelopathic effect of *L.camara* leaf extract on seed germination and growth of Fenugreek.

### 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% ( $T_1$ ), 25% ( $T_2$ ), 50% ( $T_3$ ), 75% ( $T_4$ ), 100% ( $T_5$ ) (on the basis of volume) and distilled water as a control ( $T_0$ ) treatment.

Experiments of the present investigation were carried out with fully viable healthy seeds of *Lens esculanta* as bioassay material. The seeds were surface sterilized with 0.1%  $HgCl_2$  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 petridish were set in the four replications. The treatments were kept in randomized design with laboratory of the M.G.C.G.V, Chittrakoot at room temperature ranging from 15-25°C. The experiment was extends over a period of 5th days 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 Discussion

The differences were found among various treatment for all the parameters studied i.e. percent germination, root length, shoot length and percent inhibition (Table-1).

Percentage seed germination of Fenugreek 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 ( $T_0$ ) 100%. In 10% ( $T_1$ ) concentration of *Lantana camara* aqueous leaf extract was observed 92% germination over control.  $T_2$  treatment germination were observed 78%.  $T_3$  treatment germination were observed 62% and in  $T_4$  treatment germination were observed 35% over control. Minimum percentage 15% germination was recorded in  $T_5$  treatment.

Treatment	% Germination	Shoot length (cm)	Root length (cm)	% Inhibition in		
				Germination	Shoot length	Root length
$T_0$	100	2.5	1.6	-	-	-
$T_1$	92	1.5	0.9	8.00	40	43.75
$T_2$	78	0.8	0.6	22	68	62.5
$T_3$	62	0.6	0.4	61.29	73.07	75
$T_4$	35	0.4	0.2	65.00	84	87.5
$T_5$	15	0.2	0.1	85	92	93.75

**Table. 1. Effect of *L.camara* leaf extract on germination and seedling growth of Fenugreek (*Trigonellafoenum- graceum L*) at 5th day after sowing.**

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 Fenugreek. 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 ( $T_0$ ). Maximum inhibition of shoot and root length were observed 92% and 93.75% respec-

tively in  $T_5$  treatment. In  $T_1$  treatment the plant growth were observed 40% inhibited in shoot and 43.75% inhibited in root over control. In  $T_2$  treatment the plant growth were observed 40% inhibited in shoot and 43.75% inhibited in root over control. In  $T_3$  treatment the plant growth were observed 73.07% inhibited in shoot and 75% inhibited in root over control. In  $T_4$  Treatment the plant growth were observed 84% inhibited in shoot and 87.5% inhibited in root over control.

Seeds imbibed in aqueous extracts of leaf 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. Allelochemicals are present in glandular trichomes, which inhibit the process of seed germination. So leaf extract is the most potent inhibitor. The different concentration of aqueous leaf extracts caused significant inhibitory effect on germination of *Brassica juncea*, *Raphanus sativus*, *Cucumis sativus*L, *Cicer arietinum* L, *Phaseolus mungo* and *Vigna unguiculata* (Ahmed et al, 2007). Leaf extract of *Lantana camara* had greater inhibition on the germination of *Phaseolus mungo* as compared to the extracts of stem and root. (Vijay &

Jain, 2010). The probable reason of inhibition may be the presence of allelochemicals. Many allelochemicals are present such as betulinic acid, caffeic acid, vanillic acid, ferulic acid, p-hydroxybenzoic acid, lantadene A, lantadene B, camarinic acid etc found in *Lantana camara*. The extracts of *Lantana camara* different parts such as leaf, stem, flower and fruit inhibited growth of *Parthenium hysterophorus* (Mishra & Singh, 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 tricolor* and forest crops (*Acacia auriculiformis*, *Paraserianthes falcataria*, *Albizia procera*) in the laboratory conditions (Hossain & Alam, 2010).

In the present investigation, thus concludes that all the concentrations of leaf aqueous extract of *L. camara* reduced the germination and growth *Fenugreek*. Hence the invasive and exotic weed *L.camara* having inhibiting potential should be treated as a potential to use allelopathic species suppress the growth of other weeds.

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