

Allelopathic Effect of *Lantana Camara* on Germination and Growth of Chickpea and Green Gram

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Abstract— An experiment was conducted in Department of Botany, BFIT, Dehradun, Uttarakhand during the months of February and March to understand the allelopathic effects of different concentrations taken through the leaf powder of *Lantana camara* leaf on germination percentage and early growth of two pulse crops i.e. chickpea and green gram.

The test was conducted in petridishes. Results showed that different leaf powder concentration cause great inhibitory

The term ‘allelopathy’ is used to describe the interactions between plants might lead to either stimulation or inhibition of growth. The term *allelopathy* is a Greek word made up of two words i.e. *allelo* and *pathy* (meaning “mutual harm” or “suffering”) (Willis, 2010). Allelopathy is the result of allelochemicals which are the secondary metabolites present in different parts of plants. Allelopathic nature of the plants help them to be highly competitor for space, light and nutrients with the nearby plants as reported by Syed and Imran (2001). The natural decomposition process of crop residues induced by microbes, disperse chemicals in soil which are potentially very toxic even though the primary substances were not toxic (Panahyan-e-Kiviet *et al.*, 2010). Day *et al.* (2003) reported that allelochemicals as non-nutritional chemicals produced by one organism which affect germination growth, health and behavior/population biology of other crops.

Lantana, a fast growing perennial woody shrub is a serious weed in most of the country parts, especially in Dehradun. It is an aggressive invader of natural ecosystem. *Lantana camara* (hereafter referred to as *lantana*) grows under a wide range of climate conditions and occurs on a variety of soil types reflecting its wide ecological tolerance (Baars and Neser, 1999; Day *et al.*, 2003). *Lantana* contains variety of phenolic acids and toxic substances which hinders seedling growth and development of nearby floras as reported by Achhireddy and Singh (1984).

effect on germination and growth of both the pulse crops. Results indicate that the allelochemicals were released from the leaf powder and inhibit the germination and growth of germinated crops.

Keywords— *Lantana Camara*, *Allelopathy*, *Chickpea*, *Green Gram*.

I. INTRODUCTION

According to Dobhalet *et al.* (2010) *Lantana* can also interfere growth of nearby plants by outcompeting for soil nutrients and altering microenvironment (e.g. light, temperature) by forming dense thickets (Sharma and Raghubanshi, 2007). Several researches have so far been done on the allelopathic effect of *Lantana* on various agricultural crops throughout the world (Bansal 1998).

The present investigation was carried out to further test the allelopathic nature of *Lantana camara* against two pulse crops to determine the allelopathic effect of its leaf powder on these pulse crops.

II. MATERIAL AND METHODS

The experiment was conducted in Botany Lab of BFIT College, Dehradun. It was carried out in completely randomized block design (CRBD) with different concentrations of leaf powder i.e. control, 10%, 20%, 50% and 75% and labeled as T₁, T₂, T₃, T₄ and T₅.

Preparation of leaf powder: Leaves of *Lantana camara* were collected along the sides of agricultural fields of various agricultural crops. The leaves were washed and allowed to dry at room temperature. After that the leaves were powdered by using blender in a fine powder. The leaf powder was measured to 10, 25, 50 & 75g using digital balancer. Loamy soil was collected from the agricultural fields & weighed 1000g for every treatment (10, 25, 50, 75g) of powder.

The soil is kept in containers for subsequent experiments. The allelopathic effect of plant powder was evaluated by mixing 10,25,50 and 75 in 1000g of soil. Healthy seeds are sown in containers containing different soil amendments, in every container 6 seeds were sown and allowed to germinate and grow for three weeks. 2ml of water was given to each petridishes everyday and the germination and growth of pulses was recorded at regular interval. The seeds were considered as germinated when their radicles emerge out, germination percentage was calculated by counting the seeds germinated in each petridish. The experiment was set for 21 days in the laboratory.

III. RESULTS AND DISCUSSIONS

The mean germination percentage of chickpea and green gram was recorded. The experimental results obtained suggests that leaf powder of *L. camara* exhibit profound

inhibitory effects on germination. Among the five treatments, germination percentage of chickpea (77%) was maximum in T₁ and it was decreased in all the remaining four treatments (10, 25, 50 & 75%) compared to control (100%). In green gram maximum percentage of germination was recorded in T₁ (88.66%) and it was minimum in T₅ (50%) compared to control (88.66%).

Table.1: Germination % of Chickpea & Green gram

Treatments	Germination % of Chickpea	Germination % of Green Gram
T ₁	77.66	88.66
T ₂	83	77.33
T ₃	77.33	83
T ₄	55	66
T ₅	55	50

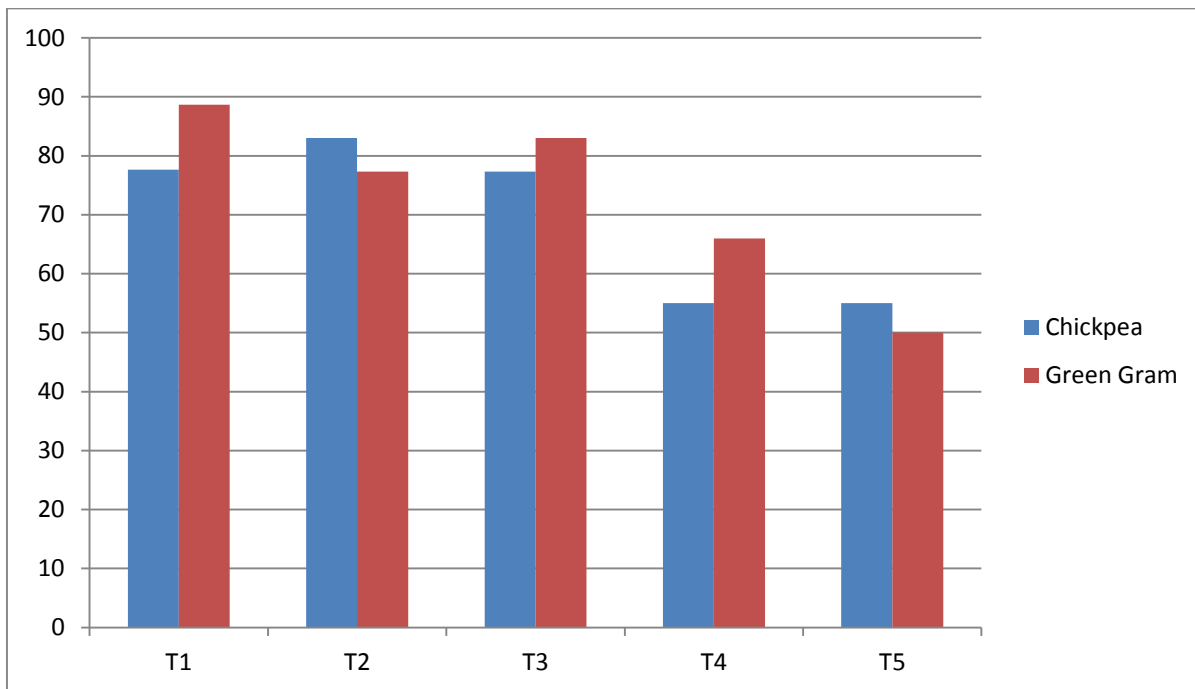


Fig.1: Germination percentage of Chickpea & Green gram

The average shoot length (cm) recorded from the germinated seedlings (Fig. 4) after 22 days are presented in Table 1. Results indicate that shoot development of chickpea was maximum (12 cm) in control (T₀). The application of *L. camara* leaf powder at 10,25,50 & 75 g (T₂,T₃,T₄,T₅) is significantly reduced shoot development. In green gram, maximum (12.65 cm) shoot development was observed in T₁ and it was minimum (5.38cm) in T₃. The

inhibitory effect was significantly increased when the application of *L. camara* leaf powder was increased.

Table.2: For growth parameters of chickpea:

Treatments	Root length	Shoot length
T ₁	12.06±3.9	12±3.17
T ₂	12.68±2.8	7.56±1.90
T ₃	7.44±2.68	2.46±1
T ₄	11.66±3.9	5.57±2.20
T ₅	9.8±3.33	5.1±3.7

Development of root growth was greatly reduced with increased amount of plant powder mixed soil. In chickpea plant, maximum (12.68 cm) root length was observed in control (T₂) and it was minimum (7.44 cm) in T₃. In comparison to control all the treated plant showed less growth due to inhibitory effect of *Lantana*. In green gram plant, maximum root development of (7.14cm) was recorded in control (T₁) and it was minimum (3.68 cm) in T₃. The mean root development was varied significantly within the treatments compared to control. Leaf powder of *Lantana camara* also have inhibitory effect on total number of leaves per plant of chickpea and the in green gram the leaves colour changes into yellow.

Table.2: for growth parameters of green gram

Treatments	Root length	Shoot length
T ₁	7.14±2.40	12.65±2.5
T ₂	4.90±1.43	7.41±2.72
T ₃	3.79±2.0	5.38±2.72
T ₄	3.68±1.38	5.5±2.49
T ₅	3.92±1.05	5.4±2.64

The present study suggests that *Lantana camara* have strong allelopathic effect on the germination and growth of various pulse crops. It was noticed that all the concentrations of leaf powder considerably reduced the yield efficiency of the test pulses compared with their respective control plants. These recordings showed that there is a negative impact of leaf powder on all the treated plants in various treatments. This negative impact is due to the various phenolic compounds which interfere the normal functioning of various metabolic activities and this findings lines the previous experiments in which it was proved that leaf powder of *Lantana camara* has inhibitory impact on various pulse crops.

IV. CONCLUSIONS

The result of the study showed allelopathic potential of leaf powder of *Lantana* on growth of green gram and chickpea. The leaf powder had differential effect on germination, root length, shoot length and leaf growth of pulse crops. Green gram is more sensitive to *Lantana* leaf powder than chickpea.

It is therefore required to control the growth of this weed so as to protect the diversity. Further studies shall be carried out to search the probable methods for control of this weed.

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