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Research Article

EFFECT OF LEAF EXTRACT OF *LANTANA CAMARA* ON GROWTH OF SEEDLINGS OF *CICER AERITINUM*

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ABSTRACT

Evaluation of effect of different concentrations of leaf extract of *Lantana camara* on seed germination, seedling growth and fresh weight of *Cicer aeritinum* has been done. In the present study allelopathic effect of leaf extract of different concentrations (15%, 25%, 75%) were compared with control treatment. After seven days of incubation at room temperature the aqueous leaf extract of various concentrations of *Lantana camara* on seed germination, root & shoot length, R/S ratio, Inhibition(-) or Stimulation(+) per cent, relation elongation of root & shoot and SVI on *C . aeritinum* have significant inhibitory effect. This study disclosed that higher concentrations of leaf extract have irregularly affected the growth of *C.aeritinum* than lower concentrations .Length of root (radicle) was more inhibited than the shoot length (plumule).

INTRODUCTION

The secondary metabolites produced by plants and microbes affect the growth and development of agricultural and biological systems. Such chemicals are called allelochems and the process of impact is called as allelopathy .The term allelopathy was coined by Molish (1937) and was defined as "encompassing the chemical interaction among all plants and microbes involving stimulatory as well as inhibitory effect". However, it has been defined as non-nutritional chemicals produced by one organism that affects the growth, germination, health and behavior of other organisms by Day *et al*. (2003). *Lantana camara*, also known as wild sage, is a thorny multi - stemmed, deciduous shrub. It belongs to class magnoliopsida, order; lamiales, family; verbenaceae genus; *Lantana* and species*; camara. Lantana camara* a tropical origin plant and is native to Central and Northern South America and the Caribbean. *L camara* is now spread to nearly 60 countries viz, New Zealand, Mexico, Florida, Trinidad, Jamaica, and Brazil. It is reported in many African countries including Kenya. Uganda, Tanzania, South Africa etc. Some species of *Lantana camara* are also believed to originate from Africa and one from India**.**

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Thakur *et al*. (1992) have reported that *L .camara* is dominant in wastelands, and in forests disturbed by fire or logging. It is also well established in disturbed areas such as roadside, railway tracks and canals (Sharma *et al*., 2005). It is a noxious weed but it has several minor uses mainly in herbal medicine. *Lantana* is a heavily branched shrub that can grow in compact clumps, dense thickets or as a climbing vine. In India, *L.camara* was probably introduced before 19th century. Currently *L.camara* is distributed throughout India. *L. camara* is known by different names in various different languages in India viz, Raimuniya (Hindi), Chaturangi and Vanacehdi (Sanskrit), Arippu and Unnichedi (Tamil), Aripoov, Poochedi, Konginipoo and Nattachidi (Malayalam), Thirei, Samballei and Nongballei (Manipur), Tantani and Ghaneri (Marathi), Pulikanpa Telegu), Kakke and Natahu (Kanada). It grows up to 1 to 3meters in height and it can spread to 2.5 meter in width. Leaves are ovate or ovate oblong, acute or sub acute, crenate, serrate, rogues above, scab rid on both sides. The leaves are 3-8cm long by 3-6cm wide and green in colour .Leaves and stems are covered with rough hairs. Small flowers are held in clusters (called umbels). Colour of flowers is usually orange, sometime vary from white to red in various shades and the flowers usually change colours as they ages. Flowers are having a yellow throat, in auxiliary head almost throughout the year. The calyx is small, corolla tube slender, the limb spreading 6 to 7 mm wide and divided into unequal lobes. Stamen four in two pairs, included

and ovary two celled, two ovuled. Inflorescences are produced in pairs in the axils of opposite leaves. Inflorescences are compact, dome shaped 2-3 cm across and contain 20-40 sessile flowers. Root system is very strong and it gives out new fresh shoots even after repeated cuttings. *Lantana camar*a has many negative impacts including potential to disrupt succession cycle, displacing native biota resulting in decreased biodiversity (Ghisalberti, 2000; Day *et al*., 2003). Understorey competitor for forestry (Sharma *et al*., 2005), reduce the economic viability of the crops (Day *et al*., 2003 and Sharma *et al*., 2005), allelopathic qualities reduces the vigor of native plant species and limits their productivity and interferes with harvesting (Sharma *et al*., 1988; Sharma and Sharma,1989 and Sharma *et al*., 2005), poisoning of livestock by plants (Pass and Heath,1978; Sharma *et al*., 1999;and Sharma *et al*., 2007) and seeds are poisonous if ingested.

The different parts of *Lantana camara* contain allelochemicals mainly aromatic alkaloids and phenolic compounds (Ambika *et al*., 2003) which can interfere with seed germination and early growth of many plant species (Sohid and Sugau, 1993, Gentle and Duggin 1977, Sharma *et al*., 2005, Ahmad *et al*., 2007). *Lantana* can also interfere with the growth of nearby plants by outcompeting for soil nutrients (Dubhal *et al*., 2010) and altering microenvironment (e.g. light, temperature) by forming dense thickets (Sharma and Raghubanshi, 2007). The studies have demonstrated that extracts from the leaves can be employed to combat antimicrobial, fungicidal, insecticidal and nematicidal problems. Its potential to serve as biocide has also been described by several scientists (Begum *et al*., 2004; Dharagadda *et al*, 2005). Many *Lantana* varieties are poisonous to stock. It is difficult to know which varieties are toxic so it is better to treat all forms as potentially poisonous. The toxins in lantana include the triterpene acids lantadene A (rehmanic acid), lantadene B, and their reduced forms. Most cases of *Lantana* poisoning occur when new stocks are introduced into lantana infested areas. Stock bred on *Lantana* infested country avoid lantana unless forced to eat it due to lack of other fodder. Young animals introduced to lantana areas are most at risk. The present study was conducted to evaluate the effect of leaf extracts of *Lantana camara* on root and shoot growth of *Cicer aeritinum*.

MATERIAL AND METHODS

The leaves of *Lantana camara* were collected from J.P. University, Chapra, campus in the month of January 2016, and were air dried in shade for 3-4 days The dried leaves were grinded to powder using laboratory blender . 10 grams of leaves powder where mixed with 100ml distilled water and were left for 24h at the room temperature and then filtered. Aqueous extract thus obtained were filtered through plastic kip with whatman filter paper. The extract was kept in a beaker for further use .The filtrate was taken to study the effect of leaf extracts on seedling growth of *Cicer aeriternum*. In this experiment 120 seeds were soaked for 24h in leaf extract. Three replicates were maintained for each treatment. One treatment was run as control with distilled water only and three concentrations (15%, 25%, 75%) of the leaf extract were used to check the allelopathic effect of *Lantana camara*. Ten seeds were placed in each petridishes with moistened filter paper. All the petridishes were maintained under laboratory conditions (room temperature). Equal volume of distilled water was added in the petridishes when moisture content of the filter paper declined. After one week number of germinated seeds were counted and the root (radical) and shoot (plumule) length were measured. Root: shoot ratio was calculated by dividing the values root by shoot.

The relation elongation ratio of root and shoot were calculated following the formula:

$$\text{Relation elongation ratio of root} = \frac{\text{Mean root length of tested plant}}{\text{Mean root length of control}} \text{X100}$$

$$\text{Relation elongation ratio of shoot} = \frac{\text{Mean shoot length of tested plant}}{\text{Mean shoot length of control}} \text{X100}$$

The values for calculation of inhibition (-) or stimulation (+) per cent were calculated following the formula given below:

$$= \frac{\text{Germinated seeds in extract} - \text{Germinated seeds in control}}{\text{Germinated seeds in control}} \text{X100}$$

RESULTS

Seed Germination

The rate of seed germination (%) was recorded after seven days of setting up of the experiment. Sharp differences in the rate of seed germination was not observed in different concentrations of leaves extract compared to control condition. The per cent seed germination was 100% in control condition and 90 to 100 % in different concentrations of leaf extract of *Lantana camara.* The minimum rate of seed germination was observed in 25% leaf extract of *L. camara* (Fig 1). NO inhibition in seed germination was observed in 15% treatment however seed germination was inhabited -6.66% in 75% treatment and -10% in 25% treatment (Table 1).

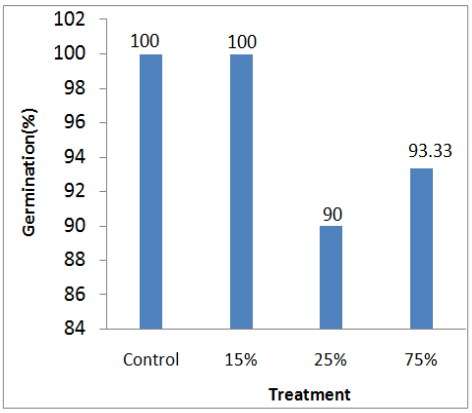

Fig.1. Seed germination of *L. camara.*

Root and shoot length

The length of root and shoot was measured after seven days of seed germination. (Table 1, Fig. 2). The length of root varied from 2.04 cm to 2.56cm in different concentrations of leaf extract of *Lantana camara* whereas this value was 4.12cm for control condition. The maximum value 2.56 cm was recorded for 75% and minimum value 2.04 cm for 25 %.The length of shoot value varied from 2.11 to 3.50cm in different concentrations of leaf extract of *Lantana camara* where as this value was 3.51 cm for control treatment. The minimum value 2.11 cm was recorded for 25% and maximum value 3.50 cm for 15% treatment.

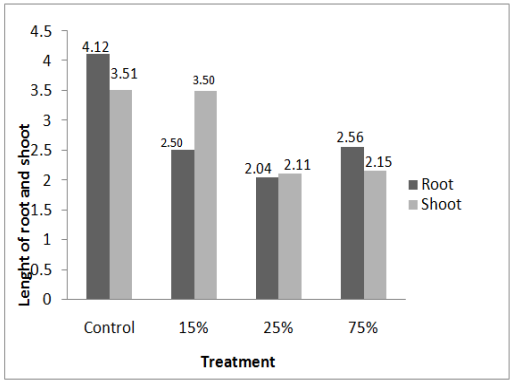

Fig. 2. Root & Shoot length (cm) of *L.camara*

Root: Shoot Ratios

The root: shoot ratios were calculated in different treatments of leaf extract of *L.camara*. This value in control condition was 1.17. The minimum value 0.71 was recorded for 15% and maximum value was 1.11 for 75% concentration (Table 1, Fig. 3). The relation elongation ratios of root and shoot were recorded in different concentrations of leaf extract of *L. camara*. These values were compared to control condition (Table 2).

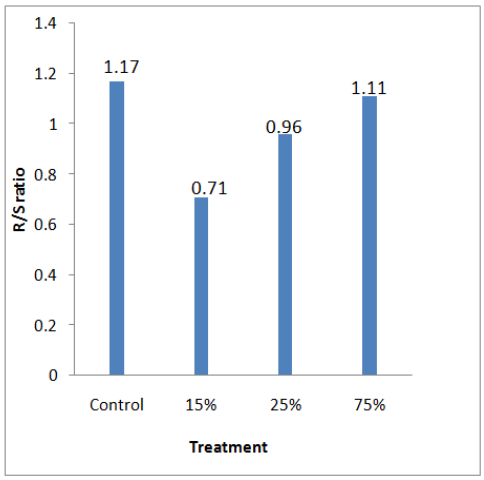

Fig.3 Root: Shoot Ratios of *L.camara*

(Table, 2). Inhibition in rate of seed germination ranged from -6.66% and -10% in case of 25% and 75% treatments, respectively (Table1, Fig. 4).

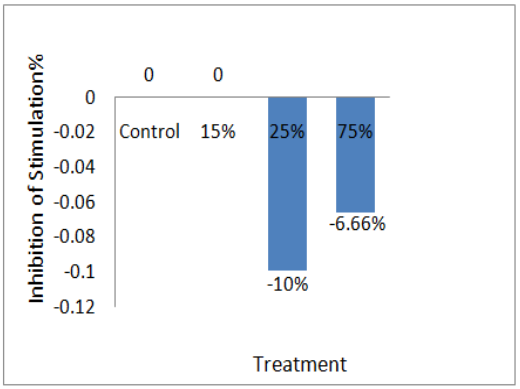

Fig.4. Inhibition (-) or Stimulation (+) %

Relation elongation ratio of root and shoot

The minimum value for root elongation ratio was 49.5% recorded for 25% and maximum value 62.13% for 75% concentrations of leaf extract (Table 2, Fig. 5).

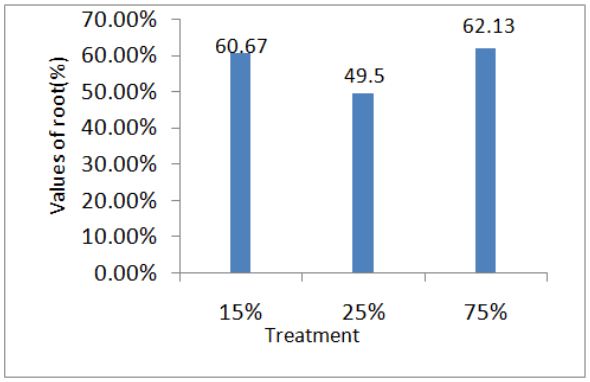

Fig.5. Relation elongation ratio of root (%)

The minimum value for shoot elongation ratio was 60.11% recorded for 25% and maximum value 99.71 % for 15% concentration of leaf extract (Fig,6).

Table 1. Impact of leaf extract of *L. camara* on seed germination, Root length, shoot length, R:S ratio and inhibition (-) or stimulation (+)

S.No	Treatment	Germination (%)	Radicle Length (cm)	Plumule Length (cm)	R/S Ratio	Inhibition (-) or Stimulation(+) (%)
1	Control	100%	4.12 ±2.40	3.51 ±04	1.17	_____
2	15%	100%	2.50 ± 0.67	3.50 ± 0.40	0.71	00
3	25%	90%	2.04 ±0.33	2.11 ±0.31	0.96	-10%
4	75%	93.33%	2.56 ±0.49	2.15 ±0.37	1.11	-6.66%

on Cicer aeritinum.

Germination Inhibition /Stimulation (%)

In this study no stimulatory only inhibitory effect on seed germination of *C. aertinum* was observed which was calculated by using the formula proposed by Sahid and Sugau (1993)

Seed Vigour Index (SVI)

The minimum value for SVI was 185.71 recorded for 25% and maximum value 355.12% for control treatment (Tableb 2).

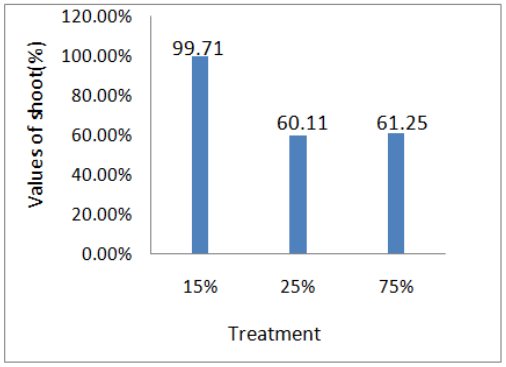

Fig. 6. Relation elongation ratio of shoot (%)

support the present findings many reports have suggested that root growth was more sensitive and responds more strong to an increase in per cent content of *Lantana* extracts (Chou and Kuo 1986, Alam., 1990, Zackrisson and Nilsson 1992 and Bansal 1998) due to allelopathic effect (Leather and Enhelling 1986 Barnes and Putnam 1987). The percentage root length inhibition was decreased in different concentrations of *L. camara* leaf extracts. Iramus *et al*., (2010) has also observed significantly suppressed root elongation on mung bean due to allelopathic effect of *Lantana* weeds. Daniel (1999), and Hossain and Alam (2010) have also observed inhibitory effect with increased concentration of Lantana leaf extract and due to osmotic effects. Bell, (1974), Anderson and Loucks (1996) and Enyew and Raja (2015) observed root inhibition of wheat and

Table 2. Impact of leaf extract of *L.camara* on relation elongation ratio of root and shoot and SVI of *Cicer aeritinum*

S.No	Treatment	Relation Elongation of Root (%)	Relation elongation of Shoot (%)	SVI
1	Control	_____	_____	355.12
2	15%	60.67%	99.71%	253.5
3	25%	49.5%	60.11%	185.78
4	75%	62.13%	61.25%	241.07

DISCUSSION

The allelopathic effect of *L .camara* leaf extract on seedling growth of *Cicer aeritenum* results indicated that the higher concentrations (25% and 75%) leaf extract have inhibitory effect on seed germination. The results in the present study is similar to the report of Achhireddy *et al*. (1985) and Casado (1995)who reported that *L .camara* is an allelopathic weed and hinders the seedling recruitment and growth of other plants due to the presence of phenolic acids. Hossain and Alam (2010) reported that phytotoxic chemicals are released from the leaf litter and roots of *Lantana*. In other related works (Jabeen and Ahmed, 2009, Hossain and Alam, 2010) suggested that *L .camara* leaf extracts have allelophathic effects on germination and behavior of agricultural crops like *Triticum aestivum* and *Cucurbita pepo. The* germination parcentage *of C .aeritinum* was 100%in 15% treatment and 93.33% in 75% treatment in the present study.

In the present study the impact of leaf extract of *L .camara* on shoot length of *C. aeritinum* was compared to control condition. It clearly indicated that shoot length data decreased in different treatments compared to control condition. 25% concentration of leaf extract of *L.camara* reduced the length of shoot of C *.aeritinum* (2.11 cm) compared to control treatment (3.51 cm) .Hossain and Alam., (2010), Enyew and Raja(2015) and Tadele., (2014) stated that the effects of lantana leaf extracts on root and shoot growth was species specific (stimulatory effect on maize and finger millet and suppressive effect on tef.) and concentration dependent and they were generally more pronounced on the roots than shoots of the agricultural crops. Sahid and Sugau, (1993) Sharma *et al*., (2005) Ahmed *et al*., (2007) and Hossain and Alam, (2010) have suggested potential interference with seed germination and growth of many plant species including agricultural crops on allelopathic effects of *L.camara*. In the present study the impact of leaf extract of *L.camara* on root length elongation decreased in different treatments of *L.camara* leaf extract. The root length values decreased when seeds were treated with leaf extract of L. camara in 15%, 25% and 75% treatments. To maize may be associated with secondary metabolites released from the extracts of *L. camara* affects root growth promoting tissues.

Conclusion

The results of the present study showed allelopathic potential of aqueous lantana leaf extracts on the growth of the agricultural crops. The leaf extracts had differential effects on the growth of the crops. In the present study .i.e. inhibitory on root length and shoot length was distinet. However, root length was more affected than the shoot length of *C. aeritenum*.

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