

## Allelopathic Effect of the Aqueous Extract of *Azardichata indica* and *Ageratum conyzoides* on the Seed Germination and Seedling Vigour of *Capsicum annum* L. *in vivo*

Shinde Archana<sup>1</sup>, Kuralapkar DD<sup>2</sup> and Gaikwad DK<sup>3</sup>

<sup>1</sup>Research Student Plant Physiology laboratory, Dept. Of Botany, Shivaji University, Kolhapur,

<sup>2</sup>Principle S.B. Khade collage, Koparde,

<sup>3</sup>Prof. & Head, Department of Botany, Shivaji University, Kolhapur.

[Email-archanashinde1488@gmail.com](mailto:Email-archanashinde1488@gmail.com)

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### ABSTRACT

The allelopathic effect of the aqueous leaf extract of *Azardichata indica* and *Ageratum conyzoides* L. on the seed germination and growth of the seedlings of *Capsicum annum* L. was studied by applying five different treatments (5,10,20 and 30%) of leaf extracts of *Ageratum conyzoides* and *Azardichata indica*. The experiment was conducted in sterilized petri dishes with photoperiod of 24 hr. The effect of different concentration of aqueous extract were compared to distilled water used as control. Results exhibited that seed germination inhibition because of allelopathic effect was found in the varieties of chili treated with different concentrations of leaf extract. All four-concentration considered for treatment showed inhibitory effect on germination of seeds in capsicum. It highest degree of inhibition in radicle and plumule growth of the test plant i.e., *C. annum* (L.) was observed in 30% concentration of both the leaf extracts.

**Key words:** Allelopathic effect, germination, root length and shoot length, *Capsicum annum* L.

### INTRODUCTION

Allelopathic efficacy of weeds on germination and seedling growth of crops vary from weed to weed (Hamayun *et al.*, 2005). The allelopathic effects of various parts of same weed also differ for their effects on germination and initial growth of plants (Aziz *et al.*, 2008; Economou *et al.*, 2002). The importance of allelopathy in growing biological control of weeds and crop productivity has been highly recognized and various methods have been suggested to know the allelopathic effects. The role of allelochemicals in agro-ecosystem has attracted the attention of many scientists. Numerous plants are reported to possess allelopathic potential and effects those plants have been applied for weed control. The chemicals with allelopathic activity are present in many plants and in many organs, including leaves, flowers, fruits and buds (Ashrafi *et al.*, 2007, May and Ash, 1990; Inderjit, 1996).

*Azadirachta indica*, is an evergreen tree native to Southeast Asia. It belongs to the family Meliaceae. It is a valuable multipurpose tree with religious, medicinal and social uses, since last 4000 years. It is widely used in toothpastes, soaps and lotion today, as well as being a biological insecticide. Many chemicals such as nimbin, nimbidin, nimbidol, gedunin, salannin (repellent), and azadirachtin (repellent, anti-feedant, antihormonal) are present in the neem trees (Sankaram, 1987). The search of plant products is choice to manage different diseases and to control the development of several herbaceous plants or weeds. *Ageratum conyzoides* L. belongs to Family Asteraceae. The plant has been used for skin diseases and wound healing, a decoction of the plant is taken to treat diarrhoea. The secondary metabolites of *A. conyzoides* include flavonoids, alkaloids, coumarins, essential oils and tannins (Chawla et al. 2013)

In the present investigation, an effort was made to study the allelopathic effects of different concentrations of *Azadirachta indica* and *Ageratum conyzoides* leaf extract on seed germination, shoot length and root length of common agricultural crop i.e. *Capsicum annum*.

## MATERIAL AND MEATHOD

The leaves were detached and washed with distilled water to remove the dust particles. Aqueous extract of *A. indica* and *Ageratum conyzoides* leaves was prepared as under 100g of fresh leaves chopped in small pieces and crushed in the mixture grinder. After grinding the material of leaves were kept in 500 ml of distilled water for 24 hours, the aqueous extract was filtered through the muslin cloth and was used to prepare different concentrations, diluting with distilled water. The concentrations; 5% (T1), 10% (T2), 20% (T3), 30% (T4)

(based on volume) were prepared for treating seeds. Distilled water was used as control (T0) treatment.

The seeds were surface sterilized with 0.1% HgCl<sub>2</sub> for 5 min and again washed with sterilized distilled water 3-4 times and were soaked for 3 hours in different concentrations of leaf extracts of both the species. The germination was carried out in sterile Petri dishes of 6 cm in size placing 2 filter papers on Petri dishes. The extract of each concentration was added to each Petri dish of respective treatment daily in such an amount just enough to wet the seeds. The controls were treated similarly with distilled water. Thirty seeds were spread on filter paper in petri dish. The Petri dishes were set in the three replicas. The treatments were kept in randomized design in Plant Physiology Laboratory, Dept. of Botany, Shivaji university, Kolhapur. at room temperature ranging from 25-30°C.

The set were kept for a period of 12days to see any change in the seed germination. The germination was recorded on daily basis. Results in the form of number of germinated seeds and root and shoot length was recorded.

## RESULT AND DISCUSSION

### Germination Percentage:

The table-1 shows the germination percentage of *Capsicum annum*. The study revealed that the leaf extracts significantly suppressed the germination and the severity of effect was proportional to the extract concentrations. The maximum seed germination percentage was shown in control. The remarkable inhibitory effect was recorded due to the *A.conyzoides* and *A. indica* at T4 treatment.

**Table. 1.** Effect of *A. indica* and *A. conyzoides* leaf extract on germination percentage of agricultural crops.

Sr. No.	Treatment	Effect on Germination			
		<i>A. indica</i>		<i>A. conyzoides</i>	
		Germination %	Inhibition %	Germination %	Inhibition %
1	T0	100	0	100	0
2	T1	96	4	96	4
3	T2	96	4	93	7
4	T3	93	7	93	7
5	T4	83	17	80	20

Values in the table indicate the inhibitory (-) effects

**Table 2:** Effect of *A. indica* and *A. conyzoides* leaf extract on Shoot elongation (cm) of receptor agricultural crops:

Sr. no.	Treatment	Effect on shoot length			
		<i>A. indica</i>		<i>A. conyzoides</i>	
1	T0	4.6			
		Shoot length in cm.	% inhibition of Shoot growth	Shoot length in cm.	% inhibition of Shoot growth
2	T1	4	13.04	3	34.78
3	T2	3.3	28.26	2.9	36.95
4	T3	2.2	52.17	2.7	41.30
5	T4	0.9	<b>80.43</b>	2.6	<b>43.47</b>

Values in the table indicate the mean of three replications showing inhibitory (-) effects in comparison to control treatment.

**Table 3:** Effect of *A. indica* leaf extract on root elongation (cm) of receptor agricultural crops.

Sr. no.	Treatment	Effect on root length			
		<i>A. indica</i>		<i>A. conyzoides</i>	
1	T0	7.6			
		Root length in cm.	% inhibition of root growth	Root length in cm.	% inhibition of root growth
2	T1	6.1	19.7	6.6	13.15
3	T2	6	21.06	5	34.21
4	T3	4.7	38.15	4.4	42.10
5	T4	2.1	<b>72.36</b>	4.3	<b>43.42</b>

Values in the table indicate the mean of three replications showing inhibitory (-) effects in comparison to control treatment

### In comparison to control treatment.

#### Shoot elongation (cm):

The shoot elongations in chilli is presented in Table 2. The extracts of fresh leaves of *A. indica* and *A. conyzoides* significantly inhibited the shoot growth of the test plants. The gradual reduction in the shoot length with increasing concentrations of extracts of leaves of *A. indica* and *A. conyzoides* was recorded in the receptor crops. The T4 concentration of both the species showed maximum inhibition of shoot growth. The *A. indica* caused 80.43% inhibition in shoot length and 43.47% inhibition by *A. conyzoides* as compare to control. The T0 (control) in both the conditions show more shoot growth as compared with treatments.

#### Root elongation (cm)

According to the result recorded in table- 3 the different concentration of aqueous leaf extract of *A. indica* and *A. conyzoides* have significant inhibitory effect on root length of test crops. In case of *C. annum* root length was decreased with the increasing concentration of extracts as compared to control. Maximum root growth was observed 7.6 cm in T0 treatment whereas lowest root length 2.1 cm was recorded in the treatment (T4) of the extracts of *A. indica*. T4 treatment of *A. conyzoides* of leaf

extract showed comparatively less effect as root length in this treatment was 4.3 cm, which is comparatively more than with T4 of *A. indica*. This shows there is more root inhibitory effect (72.36%) of leaf extract of *A. indica*.

The present study suggests that leaf extract of *A. indica* and *A. conyzoides* have negative allelopathic effect on the germination and growth of *Capsicum annum*. The probable reason of inhibition may be the presence of allelochemicals. Allelochemicals and phytochemicals are eco-friendly and free from the problems associated with present herbicides.

The present study suggests that leaf extract of *A. indica* and *A. conyzoides* have negative allelopathic effect on the germination and growth of *Capsicum annum*. The probable reason of inhibition may be the presence of allelochemicals. Allelochemicals and phytochemicals are eco-friendly and free from the problems associated with present herbicides.

In the present investigation, it is found that all the concentrations of aqueous leaf extract of *A. indica* and *A. conyzoides* have inhibitory role in the germination of

seeds and root growth of *C. annum*. The leaf extracts of both these plants can be used as herbicides for the control of weeds after similar study.

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