SHORT COMMUNICATION

ALLELOPATHIC EFFECT OF DIFFERENT CONCENTRATIONS OF AQUEOUS EXTRACT OF *AZADIRACHTA INDICA* (NEEM) LEAF ON SEED GERMINATION OF SOME PULSES

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Abstract: The present study aimed at evaluating the allelopathic effect of aqueous extract of *Azadirachta indica* leaf on seed germination of some pulses. The aqueous leaf extracts reduced the % germination, shoot/root length, fresh/dry weight and vigour index of seedlings. It also increased the mean germination time of seeds. The allelopathic effect of aqueous leaf extracts of *Azadirachta indica* increased with increase in the concentration. These result revealed that the inhibitory effect might be due to the presence of some allelochemicals in the aqueous leaf extracts of *Azadirachta indica.*

Keywords: Extract, *Azadirachta indica*, Seed germination, Pulses

INTRODUCTION

Allelopathy can simply be understood as the ability of plants to inhibit or stimulate growth of other plants in the environment by exuding chemicals. The concept of allelopathy was first introduced by Hans Molisch (1937) to describe both the beneficial and the detrimental chemical interactions of plants and microorganisms. Since then, the term 'allelopathy' has undergone several changes and it has been defined as any direct or indirect stimulatory or inhibitory effects of one plant on another through release of chemical compounds into the environment. Allelopathic substances are most commonly found in plant extracts and in plant residues of soil, some of them were found in live plant exudates and as volatile gases liberated from leaves and rhizome (Keeley, 1987). In general, leaves are the most potent source of allelochems, however, the toxic metabolites are also distributed in all other plant parts in various concentrations.

Neem (*Azadirachta* indica. A. Juss), belongs to the family Meliaceae. Since very ancient times neem has been used as traditional medicine for the treatment of various diseases. Now-a-days it is widely used in toothpastes, soaps and lotions as well as a biological insecticide. These properties have been attributed to hundreds of chemicals present in neem.

So the purpose of the present study was to elucidate the allelopathic potential of different concentrations of leaf extract of *Azadirachta indica* on seed germination of some pulses viz. *Cicer arietinum*, *Vigna radiata* and *Lens culinaris.*

MATERIAL AND METHOD

Aqueous extracts of the *Azadirachta indica* leaf were prepared by digesting 10 gm of air dried leaves of *Azadirachta indica* in 100 ml distilled water for 24 h at 25 ± 1^0C. It was filtered through whatman filter paper no.1 and the volume of filtrate was made to 100 ml. Different dilutions of the extracts i.e. 5% and 10% were prepared from this stock solution. Seeds of *Cicer arietinum*, *Vigna radiata* and *Lens culinaris* were soaked for 24 h in different concentrations of the extracts. For control, seeds were soaked only in distilled water. The seeds of pulses were sterilized by dipping in the solution of 0.1% $HgCl_2$ for 1 min, followed by 3-4 washing under running tap water to remove residues of $HgCl_2$, and dried in folds of ordinary filter paper.

Seed germination studies were conducted following ISTA rules (Ann. 2008). Between paper (Rolled towel) method is used at a constant temperature of 25^0C. 400 seeds (i.e. 100 seeds each in 4 replicates) of pure seed fraction of *Cicer arietinum*, *Vigna radiata* and *Lens culinaris* were drawn separately at random and placed equidistantly in a rolled towel. These were incubated for 8 days. The whole set of experiment was kept undisturbed at a room temperature of 25±1^0C. Only morphologically normal seedlings were scored and the average percentage germination, shoot/root length, fresh/dry weight, mean germination time and vigour index of seedlings were calculated.

%Germination was calculated by using the formula,

$$\% \text{ Germination} = \frac{\text{Germinated seeds}}{\text{Total seeds}} \times 100$$

Mean germination time (MGT) was calculated according to the equation of Ellis and Roberts (1981),

$$MGT = \frac{\sum Dn}{\sum n}$$

where n is the number of seeds that emerged on day D, and D is the number of days counted from the beginning of germination.

Seedling vigour index was determined as the product of the percentage germination and that of seedling length,

Seedling vigour index = Percent Germination × Seedling length

RESULT AND DISCUSSION

Table 1: Allelopathic effect of 5% and 10% aqueous *Azadirachta indica* leaf extract concentrations on seed germination of *Cicer arietinum*:

	Treatments		
	Control	**5%**	**10%**
%Germination	100.00	98.66	96.00
Shoot length (cm.)	11.01	6.86	6.02
Root length(cm.)	14.22	11.48	10.26
Fresh weight(g)	0.76	0.71	0.64
Dry Weight (g)	0.21	0.19	0.17
MGT(days)	1.04	1.92	2.34
Vigour index	2523.00	1809.42	1562.88

Table 2: Allelopathic effect of 5% and 10%aqueous *Azadirachta indica* leaf extract concentrations on seed germination of *Vigna radiata*:

	Treatments		
	Control	**5%**	**10%**
%Germination	100.00	98.66	97.33
Shoot length (cm)	10.78	9.00	4.86
Root length (cm)	10.91	8.50	5.92
Fresh weight (g)	0.48	0.46	0.44
Dry Weight (g)	0.13	0.11	0.07
MGT(days)	1.18	1.29	1.59
Vigour index	2169.00	1726.55	1049.22

Table 3: Allelopathic effect of 5% and 10%aqueous *Azadirachta indica* leaf extract concentrations on seed germination of *Lens culinaris*:

	Treatments		
	Control	**5%**	**10%**
%Germination	98.67	97.33	93.33
Shoot length (cm)	10.50	8.95	8.67
Root length (cm)	10.66	9.32	8.59
Fresh weight (g)	0.17	0.17	0.14
Dry Weight (g)	0.02	0.02	0.01
MGT(days)	1.66	1.81	2.25
Vigour index	2087.86	1802.70	1610.87

The use of 10% concentration of aqueous leaf extract inhibited seed germination by 4% in *Cicer arietinum*, 2.67% in *Vigna radiata* and 5.34% in *Lens culinaris*. However, low concentrations of the extract (5%) inhibited seed germination by 1.34 % in *Cicer arietinum*, *Vigna radiata* and *Lens culinaris*. Extract of leaf showed inhibitory effect, and the degree of inhibition increased with the extract concentration (Table I, II, III).

Similar trend was followed in shoot and root length. 10% aqueous extracts of leaf retarded the shoot lengths by 45.32 % in *Cicer arietinum*, 54.92% in *Vigna radiata* and 17.43% in *Lens culinaris*. Reduction percentage were 37.69%, 16.51% and 14.76 % in *Cicer arietinum*, *Vigna radiata* and *Lens culinaris* respectively when 5% concentration of leaf extract was used. The use of 10% concentration of leaf extract inhibited root length by 27.85% in *Cicer arietinum*, 45.74% in *Vigna radiata* and 19.42% in *Lens culinaris*. However, low concentrations of the extract (5%) inhibited root length by 19.27 % in *Cicer arietinum*, 22.08% in *Vigna radiata* and 12.57% in *Lens culinaris* (Table I, II, and III).

The extracts not only reduced the shoot and root length of seedlings but also reduced the fresh and dry weight. The reduction of biomass was correlated with reduction in seedling growth. The reduction in the fresh and dry weight may be due to stunted and meagre vegetative growth of seedling. This reduction may be due to phytotoxic activity of phytochemicals present in aqueous extracts.

The value of Mean germination time (MGT) expresses the rapidity of the germination i.e. the lower the value of the mean germination time the earlier will be the germination. MGT was increased with increasing in concentration of leaf extract. The results are supported by the findings of Babar *et al*., (2009) who stated that chickpea seeds soaked in root extract of *Asphodelus tenuifolius* Cav. took more time for germination. These results are also in agreement with those of Stavrianakou *et al*. (2004).

They reported inhibition of germination, germination index and increase in germination time of chickpea and lentil with the extract of different weeds.

The seedling vigour index was also reduced with the increasing concentrations of leaf extract. More delay in seed germination and lower germination index with leaf extracts could be attributed to a more inhibitory effect of allelochemicals present in leaves. The reduction of seed percentage germination, shoot/root length, fresh/dry weight and seedling vigour index of *Cicer arietinum*, *Vigna radiata* and *Lens culinaris* may reflect a presence of water soluble inhibitors in the aqueous extract of *Azadirachta indica* leaf. These results are also similar to the findings of Channappagoudar *et al.* (2005). They reported that extracts of *Cyperus rotundus* and *Commelina benghalensis* had an inhibitory effect on the germination, seedling length, and seedling vigor index of wheat, sorghum, green gram, and soybean. Agarwal *et al.* (2002), Stavrianakou *et al.* (2004), and Dongre and Yadav (2005) also reported inhibition in the length of plumule and radicle, a reduction in their dry weights and total seedling weight in wheat, pea and lentil with water extracts of various weeds.

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