

## Effect of aqueous leaf extract of *Parthenium* on seed germination and seedling emergence of some cultivated crops

J.A. Dhole, S. S. Bodke and N.A. Dhole

Department of Botany, Yeshwant Mahavidyalaya, Nanded (Maharashtra)

E-mail: jyotidhole.2008@rediffmail.com

### ABSTRACT

Allelopathic effect of aqueous extract of *Parthenium hysterophorus* (L). were studied on seed germination and seedling emergence of some cultivated crops like *Triticum aestivum* (L), *Zea mays* (L), *Sorghum vulgare* Pers., *Gossypium hirsutum* (L) and *Glycine max* (L). Seed germination of *Z. mays* was completely inhibited at 2% leaf extract of *P. hysterophorus* and of *T. aestivum*. It gradually reduced the seed germination up to concentration of 10% while in *Sorghum vulgare*, it was inhibited at 6%. At 4% aqueous extract, the maximum inhibition occurred in *Glycine max* and *G. hirsutum*. The aqueous extract of *Parthenium* showed strong inhibitory effect on the growth of root and shoot development of crops except *T. aestivum*.

**Key words:** Cultivated crops, Aqueous leaf extract Allelopathy, Seed germination, Seedling emergence.

*Parthenium hysterophorus* L, a native of tropical and subtropical America is invasive invader in large extent. It has threatened grassland ecosystem of Australia and India (Stephen and Sower 1996, Sushilkumar and Varshney 2007). Weed may possess many hazardous substances and it is very harmful to surrounding flora, animals and also to human health (Brown *et al.* 1991, Rajan 1973, Ridenour and Callaway 2001, Hierro and Calaway 2003). It has already invaded most of the useful field areas of urban and village up to an extent of 35 million hectares in India (Sushilkumar and Varshney 2007). To explore allelopathic potential of *Parthenium*, a study was conducted to see the effect of aqueous extract of leaves using different concentrations on seed germination and seedling growth of five cultivated crop species.

Plants of *Parthenium* were collected from Nanded district. From the collected weed leaves were separated and dried in shade, finely made powder using mixer grinder. Ten gram of leaf powder was taken in Soxhlet extraction apparatus and extracted in distilled water for six hours. This extract was concentrated by evaporation and stored in refrigerator for further experimentations.

Different concentrations of aqueous extract of *Parthenium*. (2, 4, 6, 8 and 10%) were made. One hundred uniform seeds of tested crops were kept for germination in sterilized Petridishes containing double layered blotting paper. Seeds were treated with different concentrations of aqueous extracts. Each treatment had three replications and one treatment was run as control with distilled water. The Petridishes were maintained under laboratory

condition for seven days. Equal volume of distilled water was added in the dishes when moisture content of the blotting paper declined. After seven days number of germinated seeds were counted and the root and shoot length were measured.

The percentage of seed germination was inhibited as compare to control in *Triticum aestivum*. There was maximum inhibition in 10% aqueous extract in wheat. In *Sorghum vulgare*, aqueous extract at concentrations from 2 to 6% or showed inhibitory action. *Zea mays*, *Gossypium hirsutum* and *Glycine max* showed inhibition at 2 to 4% while of 6 to 10% extract did not show results at the same experimental conditions (Table 1).

The effect of aqueous extracts of *Parthenium* on root, shoot growth are summarized (Table 2). Among all plant species, the root and shoot length was reduced as compare to control corresponding to increase in concentration (distilled water). In *T. aestivum*, the root length showing in range of 7.3 to 0.9 cm at concentration of 2 to 10% while for shoot length having results in range of 9.7 to 0.5 cm at concentration of 2 to 4%. In *Sorghum*, *Zea mays*, *G. hirsutum* and *G. max* and *Parthenium* showed inhibitory action at 2 to 6%.

The study demonstrated that leaf extract of *Parthenium* exhibited significant inhibitory effects on seeds germination and seedlings. Some earlier work have also reported that the *Parthenium* extract reduces root and shoot length of *Zea mays* and *Glycine max* (Bhatt *et al.* 1994).

**Table 1. Effect of aqueous extract of *Parthenium hysterophorus* L. on selected crop Plants**

Crop Plant species	Percent seed germination					
	2%	4%	6%	8%	10%	control
<i>Triticum aestivum</i>	93	80	53	19	10	95
<i>Sorghum vulgare</i>	66	20	04	-	-	83
<i>Zea mays</i>	52	-	-	-	-	100
<i>Gossypium hirsutum</i>	63	04	-	-	-	100
<i>Glycine max</i>	50	04	-	-	-	93

The results are presented are mean value n=3

**Table 2. Effect of aqueous extract on root and shoot length of selected crop plant Seeds**

Treatment	<i>Triticum aestivum</i>	<i>Sorghum vulgare</i>	<i>Zea mays</i>	<i>Gossypium hirsutum</i>	<i>Glycine max</i>
<b>Root length (cm.)</b>					
Control	15.1	10.5	18.5	16.2	8.2
2%	7.3	5.2	1.7	1.2	0.9
4%	5.2	3.4	-	0.6	0.3
6%	2.1	1.2	-	-	-
8%	1.7	-	-	-	-
10%	0.9	-	-	-	-
<b>Shoot length(cm.)</b>					
Control	10.3	8.5	16.1	12.4	5.4
2%	9.7	4.9	1.2	0.9	0.5
4%	4.8	2.5	-	0.4	0.5
6%	1.8	0.9	-	-	-
8%	1.2	-	-	-	-
10%	0.5	-	-	-	-

The results are presented are mean value n=3

Studies have also shown that the phenolics compounds found past in leaf of *Parthenium* have inhibitory effect on nitrogen fixing and nitrifying bacteria (Kanchan 1975, Kanchan and Jayachandra 1979).

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#### REFERENCES

Brown PD, Morra JM, McCaffery JP and DL Auld Willaims. 1991. Allelochemicals produced during glucosinolate degradation in soil. *J. Chemi. Ecol.* **17**: 2021-2034.  
 Ridenour WM and Callaway RM. 2001. The relative importance of allelopathy in interference : the effects of invasive weed of native bunchgrass. *Oecologica* **126**: 444- 450.

Hierro JL and Callaway RM. 2003. Allelopathy and exotic plant invasion. *Plant Soil*, **256**: 29-39.  
 Stephan WA and Sowerby MS. 1996. Allelopathic potential of the weed, *Parthenium hysterophorus* L. in Australia. *Plant Protec. Quart.* **13**: 194-197.  
 Bhatt BP, Chauhan DS and Todaria NP. 1994. Effect of weed leachates on germination and radicle extension of some food crops. *Indian J. Plant Physiol.* **37**: 177-179.  
 Rajan L. 1973. Growth inhibitors from *Parthenium hysterophorus* L. *Curr. Sci.* **42** (20): 729-730.  
 Sushilkumar and Varshney Jay G. 2007 *Gajarghas ka jaivik niyantrana : Vartman sthathi avam sambhavanaya (Biological Control of Parthenium : present and future)* NRCWS :157 p.  
 Kanchan SD. 1975. Growth inhibitors from *Parthenium hysterophorus* L. *Curr. Scie.* **44**: 358-259.  
 Kanchan SD and Jayachandra. 1979. Allelopathic effect of *Parthenium hysterophorus* L. I. Exudation of inhibitors through roots. *Plant Soil* **53**: 27-35.