

PHYTOTOXIC EFFECTS OF LEAVES OF *Parthenium hysterophorus* L. ON SEED GERMINATION OF SOME CROP PLANTS.

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Key words : *Parthenium hysterophorus* L., Allelopathic Parthenin.

Phytotoxic effects of aqueous extract of leaves of *Parthenium hysterophorus* L., a noxious weed on seed germination of some crop plants like *Triticum astivum*, *Zea mays*, *Avena sativa*, *Cicer arietinum*, *Pisum sativum*, *Lens esculenta*, *Brassica campestris*, *Raphanus sativus* and *Brassica oleracea* have been studied in the present investigation. It has been found that leaf extract of this weed exhibits allelopathic impact on seed germination of crop plants and there exists a correlation between concentration of aqueous extract of leaf of this weed and germination percentage of seeds of the crop plants taken in the present study. Allelopathic effect is due to presence of parthenin in the leaves of this weed. The seed germination of *Brassica campestris* and *Brassica oleracea* was found to be highly effected in comparison to seed germination of other plants taken in present investigation.

Key words :-*Parthenium hysterophorus* L., Allelopathic Parthenin.

INTRODUCTION

Parthenium hysterophorus L., commonly known as carrot grass or congress grass is one of the most obnoxious members of the family Asteraceae (Kohli et al 2006). This weed causes serious agronomic, medical and environmental problem (Pandey, 1992). It grows in both cultivated and waste land (Hassan & Khan, 2014). It has also been found to grow and survive in harsh climatic condition as desert (Mahmood et al, 2015). Presently this weed is widely prevalent in India (Singh et al., 2008), It has also invaded crop land causing reduction in the productivity of crop plants. Interference of this weed with field crop has been reported by Patel et al. (2011). This weed has high allelopathic impact on neighbouring plants and competitiveness with economically important crop plants (Lalita & Ashok Kumar, 2018) and can grow successfully and has capacity to replace native flora because of its allelopathic potential which poses a threat to biodiversity (Zuberi et al., 2014). Tefera (2002) has reported allelopathic inhibitory effect of leaf extract of this weed. This weed has phytotoxic effect on seed germination and seedling growth of crop plants (Khalique et al., 2016). This weed contains allelo-chemicals such as parthenin (Batish et al., 2002) Parthenin present in the leaves of this noxious weed has inhibitory effect on seed germination of both cultivated and wild species (Jha et al., 2007). The allelochemicals released from this weed may also inhibit root and shoot growth of crop plant. (Safdar et al., 2014). This weed keeps its competitors out of its space (Belz et al., 2016). Parthenin present in this weed has phytotoxic effect against a broad range of plants species including both crop plants and weeds (Dutta & Saxena, 2001). Dhole et al. (2011) has reported an inhibitory effect of parthenin extract on wheat, maize and Sorghum.

This weed has also allelopathic effect on seed germination of *Cicer arietinum* and *Pisum sativum* (Alam & Sinha, 2009). Climate change may have a considerable impact on the invasion of this weed (Bajwa et al., 2017). Allelopathic properties of *Parthenium hysterophorus* can be utilized for sustainable weed management (Lorenzo et al., 2013).

Approximately two million hectares of land in India are infested with this weed (Dwivedi et al., 2009). The present investigation was undertaken to study the allelopathic effect of *Parthenium hysterophorus* on seed germination of some crop plants.

MATERIAL & METHODS

Fresh leaves of *Parthenium hysterophorus* L., were collected from Manpur locality of Gaya town and collected leaves were dried under shade for two weeks. The air dried leaves were grinded into fine powder Ten gram of fine powder of dried leaves of this weed was mixed in 100 ml of distilled water and left for two days for proper extraction to obtain aqueous extract. The aqueous extract was obtained as filtrate of the mixture and then final volume was adjusted to 100 ml which provided 10% aqueous extract of leaves of *Parthenium hysterophorus*. From the aqueous extract, solution of different strength viz 2.5%, 5.0% and 7.5% were prepared by dilution. The seeds of crop plants taken for the present investigation were surface sterilized by using 2% sodium hypochlorite. The surface sterilized seeds were taken in sterilized petridishes lined with blotting paper which was moistened with 10 ml aqueous extract of leaves of *Parthenium hysterophorus* of different strength in different petridishes. These

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petridishes including control were kept in laboratory for ten days. When the moisture content of blotting papers declined, equal volume of distilled water was added in petridishes the number of germinated seed were calculated and percentage of seed germination was determined.

OBSERVATION

The allelopathic effect of aqueous extract of leaves of *Parthenium hysterophorus* on the seed germination of crop plants taken in the present study has been observed. The germination of seeds of all the crop plants taken in present study were found to be adversely affected by aqueous extract of leaves of *Parthenium hysterophorus*. The germination percentage of seed varied in different concentration of aqueous extract of leaves. The inhibitory effect on seed germination depended on the concentration of leaf extract of this weed. The germination percentage of seed treated with 10% aqueous extract was found to vary from 5% to 20%. The lowest germination percentage was recorded in *Brassica campestris* and *Brassica oleracea* which was found to be 5%. The inhibitory effect of aqueous extract of leaves of *Parthenium hysterophorus* as observed in the present investigation is noted in Table-I

Table-I

Plant Species	No of Seeds taken	Control		Treatment							
		No of seeds germinated	Germination %	2.50%		5.00%		7.50%		10.00%	
				No of seed germinated	Germination %	No of seeds Germinated	Germination %	No of seed germinated	Germination %	No of Seed germinated	Germination %
<i>Triticum aestivum</i>	20	18	90%	10	50%	8	40%	5	25%	3	15%
<i>Zea mays</i>	20	16	80%	8	40%	7	35%	5	25%	3	15%
<i>Avena sativa</i>	20	17	85%	11	55%	9	45%	7	35%	4	20%
<i>Cicir arietinum</i>	20	17	85%	10	50%	7	35%	5	25%	4	20%
<i>Pisum sativum</i>	20	15	75%	9	45%	6	30%	4	20%	3	15%
<i>Lens esculentus</i>	20	16	80%	12	60%	8	40%	6	30%	4	20%
<i>Brassica campestris</i>	20	15	75%	7	35%	5	25%	3	15%	1	5%
<i>Raphanus sativus</i>	20	16	80%	8	40%	6	30%	4	20%	2	10%
<i>Brassica oleracea</i>	20	14	70%	7	35%	5	25%	20	10%	1	5%

The germination percentage of seed was found to vary from 35% to 60% in 2.5% aqueous extract of leaves of this weed in this case highest germination percentage of seed was recorded in *Lens esculentus* whereas *Brassica campestris* and *Brassica oleracea* exhibited lowest percentage of seed germination. Similarly seeds treated with 5.0% aqueous extract of leaves of this noxious weed were also found to show variation in their germination percentage which varied from 25% to 45%. The maximum and minimum percentage of seed germination was recorded in *Avena sativa* and *Brassica* species respectively. In case of treatment of seed with 7.5% aqueous extract, *Avena sativa* exhibited highest percentage of seed germination which was found to be 35% where as *Brassica oleracea* exhibited lowest germination percentage of which was 10%.

DISCUSSION

It is obvious from the data mentioned in table-I that the aqueous extract of leaves of *Parthenium hysterophorus* has inhibitory effect on seed germination of crop plants. The phytotoxic effect on seed germination is due to presence of allelo- chemical, particularly parthenin (Belz *et al.*, 2016). The inhibitory effect of aqueous extract of leaves of this weed was found on the seed germination of all crop plant taken in the present study. There have also been similar previous reports of inhibitory effects of *Parthenium hysterophorus* on seed germination of many crop plants (Acharya and Rahman, 1997). Phytotoxic effects of *Parthenium hysterophorus* residues on *Brassica* species has also been reported by Singh and Patel (2005). *Phytochemical* analysis has already reported presence of high concentration of growth inhibitors in the leaves of *Parthenium hysterophorus*. *Parthenin* is chemically sesquiterpene lactone and it has serious allelopathic and phytotoxic effects. The inhibitory effect of *Parthenium hysterophorus* was found to be comparatively higher on the *Brassica oleracea* seed germination than on *Brassica campestris* as observed in the present study. Singh *et al.* (2005) has also reported phytotoxic effect of *Parthenium hysterophorus* residues on seed germination and seedling growth of *Brassica campestris* and *Brassica rapa*. Germination percentage of seeds of crop plants studied in the present investigation was found to decline with increase in concentration of aqueous extract of leaves of these weeds. This trend shows that there exists a correlation between concentration of aqueous extract of leaf of *Parthenium hysterophorus* and germination percentage of crop plants. It has been observed in the present study that in 10% aqueous extract percentage of seed germination was very low.

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