

# Allelopathic Effects of *Medicago polymorpha* L on Seed Germination and Seedling Growth of *Pisum Sativum arvense*



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## Abstract

Chemicals release into the environment by one plant can inhibit or stimulate the growth of other plants, this interaction is known as allelopathy and the chemicals are called allelochemicals. The allelochemicals are water soluble compounds belonging to phenolic acid and their derivatives, terpenoids, steroids, flavonoids, alkaloids and tannins. In the present study the allelopathic effects of *Medicago polymorpha* L. a troublesome winter weed upon the seed germination and seedling growth of pea (*Pisum sativum*, arvense) has been investigated by using petridish experiments. Phytotoxicity was tested by making 100%, 75%, 50%, 25% and 10% concentrations of weed. Toxicity was more pronounced in 100% concentration of weed due to failure of seed germination. The allelopathic effects are reduced at low concentration of weed extract due to dilution of toxicity. The present investigation also shows that increase in weed concentration is the decrease in shoot length and root length of pea.

**Keywords:** Allelopathy, Allelochemicals, *Medicago polymorpha*, Germination

## Introduction

Several plants release some organic and inorganic compounds into surrounding environment which affect the growth of other plants (Rice 1984). These chemicals are known as allelochemicals. Rice (1986) described these chemicals as water soluble compounds belonging to phenolic acid and their derivatives terpenoids, steroids, flavonoids, alkaloids and cyanhydrin and tannin as most important chemical groups. Grummer (1955) called these chemicals as phytoncide produce by higher plants.

The allelopathic effects of some plants on seed germination and seedling growth have been studied by several workers, example, Ganajaxi and Hedge (1998) studied *Parthenium hysterophorus* L and cassia plant on different field crops, Mandal et al (2003) studied *Dalbergia sisso*, *Acacia lenticularis* and *Bombax ceiba* on wheat, Gupta and Saxena (2004) studied terrestrial plants on mustard, Hans (2005) studied *Asphodelus tenuifolius* and *Euphorbia hirta* on Bajara, Ahmed et al (2008) studied *Leucaena leucocephala* on some forest and agricultural crops, Aleksieva and Serafimov (2008) studied *Amaranthus retroflexus* L and *Solanum nigrum* L on soybean, Zhang and Shengleifu (2010) studied eucalyptus sps on different crops, Alsaadawi et al (2012) studied allelopathic potential of sunflower on weeds and wheat, Ashfaq et al (2014) studied allelopathic association between weed extracts and rice seedlings, Hayatu et al. (2016) studied *Eucalyptus camaldulensis* on germination and growth of some local and improved cowpea (*Vigna unguiculata* L Walp) and Chopra et al (2017) studied *Echinochloa colona* L and *Cyperus iria* L on Rice and Soybean. However allelopathic effects of *M. polymorpha* on pea plant have not been studied so far, therefore the present work has been undertaken.

## Aim of the Study

The aim of present study is to conclude the Allelopathic Effects of *M.Polymorpha*, a troublesome weed on seed germination and seedling growth of Pea.

## Material and Method

Fresh plant of *Medicago polymorpha* were collected from the fields and brought to the laboratory. Plants were thoroughly washed with

tap water and crushed with mortar and then allowed for filtration through filter paper. The solution was centrifuged for 15 minutes and supernatant was used to make solutions of 100%, 75%, 50%, 25% and 10% concentration by adding distilled water. A separate set of control was also maintained. The experiment was done in petridishes which were kept at room temperature. 10 seeds of pea (*Pisum sativum* arvense) were placed in each petridish between two moist filter papers. The experiment was done in triplicate. Watering was done once in a day with 100%, 75%, 50%, 25% and 10% extract solution and with distilled water as control. Observation on seed germination, root length and shoot length was recorded on 15<sup>th</sup> day of experiment.

### Result and Discussion

Aqueous extract of *M. polymorpha* produced significant effect on germination and seedling growth

of *pisum sativum* (table 1). There is no significant difference in germination when seeds are treated with water (control) and 10% extract solution. In both cases 100% germination was observed. The rate of germination was decreased with increase in concentration of weed extract. 25% and 50% of weed extract didn't show any significant difference in germination. Germination was decreased at 75% concentration of weed extract. No germination was observed in 100% concentration of extract.

The shoot length and root length was increased with decrease in the concentration of plant extract. It was maximum in control and minimum at 75% extract solution. However, low concentration of weed does not show significant effect on the root length of pea. Our findings are supported by Sharma et al. (1991).

Table-1

### Allelopathic Effects of *Medicago polymorpha* L on Seed Germination and Seedling Growth of *Pisum sativum*

Concentration of solution	Germination % (mean SE ±)	Shoot length Mean SE ± (cm)	Rest length Mean SE ± (cm)
Control	100.0±0.00	1.84±0.12	3.80±0.44
10%	98.33±1.66	2.00±0.57	2.96±0.29
25%	80.00±5.77	1.67±0.44	0.67±0.29
50%	46.67±3.34	1.12±0.072	0.80±0.15
75%	33.34±3.33	1.00±0.28	0.57±0.29
100%	--	--	--

The perusal of Table 1 indicates that the whole plant extract of *M. polymorpha* decreases the rate of germination in pea. Similarly inhibitory effects of *Parthenium hysterophorus* extract have been on *Zea mays*, *Sorghum vulgare* and *Cajanus cajan* (Mall and Dagar 1979); and on *Brassica compestris* (Kumari et al 1986)

From the above findings it becomes vivid that *Medicag polymorpha* must be checked to save the natural structure of crop fields

### References

- Ahmed R (2008) Allelopathic effects of *Leucaena leucocephala* leaf litter on some forest and agricultural crops grown in nursery. *Journal of forestry research*. 19:298
- Aleksieva A. and Pl. Serafimov (2008) A study of allelopathic effect of *Amaranthus retroflexus* L. and *Solanum nigrum* L. in different soya bean genotypes. *Herbologia*: 2, 47-58
- Alsaadawi S Ibrahim, Ali K Sarbout and Laith M Al-Shamma (2012) Differential allelopathic potential of sunflower (*Helianthus annuus* L.) genotypes on weeds and wheat (*Triticum aestivum* L) crop. *Archives of agronomy and soil science* 58(10):1-10.
- Asfaq M, A Ali, MS Haider, M Ali and A Ullah (2014) Allelopathic association between weeds extract and rice (*Oryza sativa* L) seedlings. *Journal of pure and applied microbiology* 8:573-580.
- Chopra N., T. Geeta, Tewari L.M., Upreti Brij and Pandey N. (2017) Allelopathic effect of *Echinochloa colona* L. and *Cyperus iria* L. weed extracts on seed germination and seedling growth of rice and soyabean. *Advances in agriculture*, 2017: 1-5
- Ganajaxi and Hedge Y (1998) Allelopathic effects of *Parthenium hysterophorus* and cassia plant extract on germination of different field crops. *Seed research* 31 (2):266-268
- Grummer G (1995) "Degegenseitige Beeinflussnghohere Pflazen Allelopathie" Fischer- Jena
- Gupta J and Saxena M. K. (2004) Allelopathic interactions of terrestrial plants on mustard seed germination. *Advances in plant sciences* 17 (1): 199-201
- Hans D (2005) Allelopathic effect of monocot *Asphodelus tenuifolius* L and dichotic *Euphorbia hirta* L on seed germination and growth characteristics of new 2210 Bajara variety. *Conference of B.S.I. Abstract* pp.203
- Hayatu ,M., Mohammed U A and Juji H A (2016) Effect of *Moringa oleifera* and *Eucalyptus camaldulensis* leaf extracts on germination and growth of some local and improved cowpea (*vigna unguiculata* L. Walp) genotypes. *Biological and Environmental Sciences Journal for the tropics* 13(2)
- Kumari A, Kohli R. K. and Saxena D. B. (1986) Allelopathic effect of *Parthenium hysterophorus* leachates and extracts on *Brassica compastris*, *Ann. Biol.* 1: 189-196
- Mall L. P. and Dagar J C (1979) Effect of *Parthenium hysterophorus* extract on germination of 3 crops *J. I. B. S* 58:40-43
- Mandal M P, Das D. K. and Chaturvedi O. P. (2003) Allelopathic effect of three agro forestry tree species on seed germination and seedling growth of certain wheat varieties. *Indian J Ecol.* 30(2): 159-167

14. Rice E. L. (1984) *Allelopathy 2nd Edison*. Academic Press, New York
15. Rice E. L. (1986) *Allelopathic growth stimulation*. In: *The science allelopathy* (Eds) A R Putnam and C S Tang. PP 23-43 New York, Wiley interscience.
16. Sharma S C, Sarbhai R and Devi U (1991) *Allelopathic effects of Parthenium hysterophorus* L. on seed germination and seedling growth of *Phalaris minor* Retz. *J. Indian. Bot. Sc.* 70 (supplement) p-67.
17. Zhang Chenlu and Shenglei Fu (2010) *Allelopathic effects of leaf litter and live roots exudates of Eucalyptus species on crops*. *Allelopathy Journal* 00(26):91-100.