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ALLELOPATHIC POTENTIAL OF WEED SPEICES *AGERATUM CONYZOIDES* L. AND *CLEOME VISCOSA* L. ON GERMINATION AND GROWTH OF *SESAMUM INDICUM L.*

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ABSTRACT

Various concentrations (5%, 10%, 15% and 20%) of aqueous extracts prepared from two weed species namely *Ageratum conyzoides* L. and *Cleome viscosa* L. and used for the present experiments to determine their allelopathic potential on growth and developmental changes on *sesame* (*Sesamum indicum* L.*)*. The weed extracts showed an inhibitory effect on germination percentage, root and shoot growth, and fresh and dry weight of *sesame* seedlings. The extracts of *A.conyzoides* had more inhibitory effect at 20%concentration,than that of *C.viscosa* on growth parameters of *sesame*.

Keywords: Allelopathic potential, *Ageratum conyzoides, Cleome viscosa*, Sesame.

1. INTRODUCTION

Allelopathy generally refers to the detrimental effects of higher plants of one species (the donor) on the germination, growth or development of plants of another species (the recipient) (Narwal, 1994). Molisch (1937) coined the term allelopathy from two Greek words, where allelon means 'to each other' and pathos means 'to suffer'. In natural or man managed agro-ecosystems, neighboring plants may interact with the growth and development of other species. Muller (1969) suggested the term interference for the overall influence of one plant (including microorganisms) on another. In agro ecosystems, several weeds, crops, agroforestry trees and fruit trees have been shown to exert allelopathic influence on the crops, thus affecting their germination and growth adversely (Kohli *et al.,* 1998). Allelopathy plays a key role both in natural and managed ecosystems. Eventhough allelopathy includes both positive and negative effects of one plant on the other; most of the studies seem to focus only on its deleterious impacts alone.

In agriculture, the inhibitory effect of weed species on germination and growth of crops has been attributed to phytotoxic chemicals released from the leaf litter and roots. Further, Rice (1974) observed that many species of weeds produce toxins that are inhibitory to other weeds, crops and often to themselves**.** The regular irrigation to the crop fields and natural rain, which are leachates the inhibitory substances of weed biomass in the root zone of crops impairs the germination and growth of cereals, millets and other crops (Jha and Sen,1985). If the weed parts containing water soluble allelochemicals, it is likely that crop seedlings would be subjected to growth inhibition.The objectives of this research were to assess the impact of two weed species *Ageratum conyzoides* L. and *Cleome viscosa* L. on growth and development of sesame (*Sesamum indicum* L.) under green house study.

2. MATERIALS AND METHODS

The preparation of aqueous weed extracts and germination studies were followed as per the methods of Padhy *et al.* (2000) and Bhatt and Chauhan (2000).The collected fully matured weed species of *Ageratum conyzoides* L. and *Cleome viscosa* L. were air dried, ground to fine powder and extracted in water. Twenty grams of ground weed material was soaked in one litre of distilled water and kept 48 hours at room temperature with occasional shaking. The infusion was decanted and filtered through three layers of Whatman No.1 filter paper. From this weed extracts (20%) further dilutions of 15,10 and 5% were prepared with distilled water. The selected seeds of sesame cv.TKM-1 were surface sterilized with 0.03% formalin solution for 20 min. and then washed thoroughly with distilled water (DW). For the germination study 15 seeds were sown in earthen pots(15cm x 30cm) filled with 3.5kg of normal garden soil. Equal quantity of weed extracts/DW was irrigated to all the pots on 0,3, 6, 9, 12 and 15 days after seed sown. Each treatment including control was replicated five times. The number of seeds germinated in each treatment was counted daily up to 10^{th} day after sowing, and germination percentage was calculated. The emergence of radicle was taken as criteria for germination. Five seedlings

from each replicate was selected for recording the morphological parameters such as length of shoot and root, fresh and dry weight on 15th day after sowing.The mean data was statistically analysed by ANOVA at P<0.5%.

3. RESULTS AND DISCUSSION

Aqueous weed extracts of *A. conyzoides* and *C. viscosa* caused a significant inhibition on the germination of sesame seeds over control. The intensity of inhibition differed depending upon the concentration and weed species. As the concentration of the weed extracts increased the degree of inhibition on germination percentage was increased (Table 1). The extracts of both the weed species significantly affected the germination percentage of sesame more at their higher concentration (20%) and the effect was more intense by the extracts of *A.conyzoides* than *C.viscosa*. The reduction on the shoot and root length and biomass content of sesame seedlings (Table 2) was more by *A.conyzoides* than *C.viscosa* extract treatments. As the concentration increased, the seedling growth and seedling fresh and dry weight decreased. Similar results were obtained by Alsaadawi and Salih (2009), in which, they reported the root exudates of *C. rotundus* significantly reduced the root and shoot growth of tomato and cucumber plants. The reduction in the seedling growth and biomass production may be due to imbalance in water uptake or osmotic balance of the tissues for germination and growth by the allelochemical toxicity of the extracts (Blum *et al.,*1999).

Table 1. Aqueous extracts of *A. conyzoides and C. viscosa* on seed germination and seedling length (cm/plant) of sesame.

Concentrations (%)	Germination %		*A. conyzoides*		*C. viscosa*	
	A. conyzoides	*C. viscosa*	Root length	Shoot length	Root length	Shoot length
Control	98	96	13.3	8.0	13.3	8.0
5	84 (-14.3)	86 (-11.6)	12.8 (-3.7)	7.5 (-6.2)	13.0 (-2.2)	7.3 (-3.9)
10	74 (-24.5)	75 (-21.8)	10.7 (-19.5)	7.0 (-12.5)	11.0 (-17.3)	6.8 (-10.5)
15	60 (-38.7)	62 (-35.4)	8.8 (-33.8)	5.0 (-37.5)	9.0 (-32.3)	5.4 (-29.0)
20	54 (-45)	58 (-39.5)	4.7 (-64.6)	3.5 (-56.2)	5.0 (-62.4)	3.6 (-52.6)
Average	63	66	10.06	6.02	10.26	6.22
F	196.6897		RL-915.90, SL.263-84			

Data in parenthesis indicates % increase (+), decrease (-) over control.

Table 2. Aqueous weed extracts of *A. conyzoides and C. viscosa* on the fresh and dry weight (mg/plant) of *sesame.*

Concentrations (%)	*A. conyzoides*		*C. viscosa*	
	Fr.Wt	Dry wt.	Fr.Wt	Dry wt.
Control	80	18	80	22
5	74 (-7.5)	15 (16.6)	76 (-5.0)	19 (-13.6)
10	68 (-15.0)	13.5 (-25)	70 (-12.5)	17 (-22.7)
15	55 (-31.2)	11 (-38.8)	60 (-25.0)	14 (-36.3)
20	40 (-50)	9.5 (-47.2)	45 (-43.7)	12 (-45.4)
Average	63.4	16.8	66.2	13.4
F	FW-77.87; DW-2.15			

Data in parenthesis indicates % increase (+), decrease (-) over control.

The fresh and dry weight decreased when increasing the concentrations (10%, 15%, 20%) of weed extracts. The result of Drost and Doll, (1980) favors the present findings, where the plant residues and tuber extracts of yellow nutsedge (*Cyperus esculentus* L.) inhibited the germination and growth of corn (*Zea mays* L.) and soybeans (*Glycine max* (L.) Merr.). Present results are also similar to the findings of Channappagoudar *et al.,(*2005).They reported that the extracts of *Cyperus rotundus* and *Commelina bengalensis* had an inhibitory effect on the germination, seedling length of wheat, green gram and soybean. The higher concentration of leaf, new shoot and old shoot extracts of *Tinospora cordifolia* inhibited the germination of *Sesamum orientala* and *Eleusine coacana.(*Bhupendra Singh *et al*.,2009).Asif Tanveer *et al*.,(2010) recorded the weed *Euphorbia helioscopia* caused an inhibition on growth and development of three crops *i.e.,* wheat, chickpea and lentil. The inhibitory effects may be due to the presence of higher amounts of growth inhibitory substances in the tuber extracts that were released during extraction.

The differential degree of inhibitory (5,10, 15 and 20%) effect on the growth of *sesame* may be due to the presence of allelochemicals at different concentration of both weed extracts. Verma *et al.,* (2002) found the extracts of *Cyperus rotundus* adversely inhibited the seed germination, seedling growth and biomass production of *Brassica* and tomato. Jeyasrinivas *et al.,*(2006) reported that the higher concentrations of *Trianthimum portulacastrum, Cyanodon doctylon* and *C.rotundus* leaf leachates inhibited the seed germination,shoot length, root length and drymatter production of pearmillet, cowpea, sesamum and cucumber. These results are coinciding with our present results. Many of the allelochemicals are water soluble substances released into the environment through leaching, root exudation, volatilization and decomposition of plant residues and are affected by several environmental factors (Reigosa *et al.* 1999). Akobundu (1987) listed factors such as soil temperature, soil moisture regime, alternate wetting and drying of soil, soil nitrate level among others as those that affect seed germination. These results are supported by the findings of Oke (1988) that siam weed extract inhibited the germination of seeds of cowpea, soybean and tridax.

Present findings are also agree with the results of Hussain *et al.,*(1992). They reported that *Imperata cylnidrica* reduced the early growth, fresh and dry weight of lentil. JaiKnox *et al*.,(2010) reported that *Cassia occidentalis*, *Rumex dentatus*, *Calotropis procera* and *Withania somnifera* inhibited germination and growth of *Parthenium hysterophorus.* The presence of inhibitory chemicals in higher concentrations of the extract might be the reason for differential behaviour of the extracts and causing maximum reduction in growth of the seedlings. Phytotoxicity of allelochemicals present in the weed extracts might be caused synergistic activity on the germination and growth of sesame seedlings rather than single chemical. The statistically observed significances are evident for the inhibitory effects of *A.conyzoides and C.viscosa* on the growth of sesame. The studies are further to be extended in field level experiments for exploring the impact of residues of *A.conyzoides and C.viscosa* on growth and yield attributes of sesame..

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