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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences, 2 (3): 737-738, 1999 Research Article

Allelopathic Influence of Eucalyptus (*Eucalyptus camadulensis* L.) on Germination and Seedling Growth of Crops

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Abstract

Experiments were conducted to evaluate allelopathic influence of eucalyptus on the germination and seedling growth of cotton, sunflower, sorghum, mungbean and mothbean under the laboratory conditions. One kg of fresh leaves of eucalyptus was soaked in ten liter of water for 72 hours. This extract was used in seeds soaking prior to sowing in the pure sand culture. The same extract was applied to the germinated seeds in comparison with simple water application to the control treatments. The results revealed that application of aqueous extract of fresh leaves to seeds of all crops reduced the germination and suppressed the growth of roots and shoots of seedlings of crops belonging to different families.

Introduction

Some trees have ill effects on the germination and growth of various crops which may be due to release of chemical compounds from roots and leaves. Molisch (1937) coined the term to refer to bio-chemical interaction between all types of Plant, including micro-organisms. He meant the term to cover both determintal and reciprocal biochemical interactions. Muller (1969) mentioned allelopathy as a biochemical interaction between plants through release of secondary substances into the environment by decomposition of plant residues. Allelopathy with reference to interaction between woody perennial and agricultural crops has assumed a considerable importance for improvement and development of agroforestory system. Allelopathy involves the release of chemicals into the ecosystem. These chemicals have harmful effects on the crop in the ecosystem resulting in the reduction and delaying in germination, mortality of seedlings and reduction in growth and yield (Malik, 1991). *Eucalyptus* species may have variable effects as Anwar (1991) observed greater allelopathic effects of the fresh leaves extract of *Eucalyptus alba* than that of *E. deglupta* and *E. robusta* on the growth of maize seedlings. Similarly Sanginga and Switt (1992) proved reduction in germination of maize seeds when soaked for 48 hours in different proportions of the extract of *Eucalyptus camaldulensis* on comparing with water. Germination % age was reduced from 0 to 17 percent as compared with 97 percent after soaking with water. Bisal *et al.* (1992) reported that Eucalyptus has harmful effects on germination and seedling growth of wheat, barley, lentil, chickpeas and mustard. Lisanework and Michelsen (1993) suggested that plantation of *Eucalyptus camaldulensis* and *E. saligna* in integrated land use system should be minimized because of their greater allelopathic effects on chickpea, maize and peas. Euclayplus is being established in the irrigated area of D.I.Khan because of fast growing nature of eucalyptus and expansion in commanded area of CRBC, project. Information regarding its allelopathic effects on the growth and yield of different crops will be helpful in the future agroforestory.

Materials and Methods

Experiments were conducted to determine the allelopathic effects of aqueous extracts of fresh leaves of Eucalyptus on the germination and seedling growth of cotton, sunflower, sorghum, mungbean and mothbean under the laboratory conditions in the Department of Agronomy, Faculty of Agriculture, Gomal University, Dera Ismail Khan during 1996. One kg of fresh leaves of *Eucalyptus camaldulensis* L. was soaked in ten liter of water for 72 hours. Seeds of each crop after soaking in the aqueous extracts for 72 hours were sown in pure sand culture. Equeous extract was applied to half of sown seeds of each crop. The remaining half seeds were irrigated in the simple water. The data were recorded on germination, shoot and root length and fresh weight of shoots and roots during the course of the experiment. Fisher's t-test (Steel and Torrie, 1980) was applied to the recorded data on each parameter individually so as to observe the statistical difference between the two treatment means.

Results and Discussion

Seed germination: It is clear from the results that application of aqueous extracts reduced germination of all crops. Seed germination of cotton was severely inhibited and only 40 percent seed germination was observed when soaked in extract of Eucalyptus leaves. However, mungbean showed little response to extract of Eucalyptus leaves. Similarly, Puri (1992) observed that 25-100 percent leaf and bark leachates of Eucalyptus were toxic to germination and growth of *Phaselous vulgaris* seedlings. Similar inhibitory effects of Eucalyptus were reported by Narwal and Sarmah (1992) and Lisanework and Michelsen (1993).

Root length: Data pertaining to root length of cotton, sunflower, sorghum and mothbean are presented in Table 1. Obviously the seedlings grown in control treatment where simple water was applied showed greater root length

than aqueous extract application in all crops. It might be due to ill effects of allelo-chemicals of extract on roots. Puri and Khara (1991) reported similar results and found the inhibitory effects of eucalyptus on primary root development of *Phaseolus vulgaris*.

Table 1: Allelopathic effects of Eucalyptus on seed germination (%), root length (cm) and shoot length (cm) of different crops

Crops	Control	Soaked	t-value
	Seed germination		
Cotton	80	40	--
Sunflower	52	48	--
Sorghum	100	76	--
Mungbean	90.5	87	
	Root length		
Cotton	7.83	5.66	1.40
Sunflower	2.95	1.25	3.55
Sorghum	4.74.	1.66	5.25
Mothbean	3.32	2.02	1.19
	Shoot length		
Cotton	10.17	9.16	0.45
Sunflower	10.61	3.39	6.68
Sorghum	15.27	5.99	7.11
Mothbean	13.25	11.60	-0.36

Shoot Length: Comparison of treatments revealed that shoot length of cotton, sunflower, sorghum and mothbean was reduced with the application of extract (Table 1). Narwal and Sarmah (1992) observed that the allelopathic effects of Eucalyptus on millet, sorghum, maize, castor, pigeonpea and sunhemp and reported that there was a gradual increase in height with increasing distance from Eucalyptus trees. Singh and Kohli (1992) found poor crop performance including germination trials and vegetative growth due to inhibitory effect of allelo-chemicals excreted by Eucalyptus.

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