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Allelopathic potential of stem, root and seeds of *Albizia-lebbek* L. (Benth.) against germination of seeds of *Raphanus sativus* L.

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Abstract

Allelopathy is study of biochemical interactions shown by phytochemicals released by a specific plant causing adverse effect on germination and growth of neighbouring plant species or microorganisms. Hexane and ethyl acetate fractions of crude extract of different parts viz. stem, root and seeds of *Albizia lebbek* were examined for their growth inhibitory potential against germination of seeds of *Raphanus sativus* (radish). The comparative analysis of growth inhibition of radish seeds by hexane and ethyl acetate fractions of stem, root and seeds of *Albizia lebbek* are being reported in this paper.

Keywords: allelopathy, phytochemicals, albizia lebbek, raphanus sativus, fractions

1. Introduction

India has 15 agro-climatic zones with 47000 plant species out of which 15000 are outlined to have important medicinal properties (Kumar *et al*, 2007) [1]. The word 'Albizzia' has come from Filippo degli Albizzi, an Italian naturalist of 18th century who in the mid. 18th century introduced Siris to Europe (Chopra *et al*, 1984) [6]. *Albizia-lebbek* (L.) Benth. has some common names as Siris (Hindi), Bhandi, Kalinga (Sanskrit), Darash (Urdu), Parrot Tree (English) (Kumar *et al*, 2007, Mishra *et al*, 1995) [1, 2]. Plant growth inhibitory effect was found proportional to the concentrations of the aqueous extracts of *Albizia-lebbek* (Uddin *et al*, 2007) [3]. The phytochemicals released from any dead or alive plant part can cause an inhibitory or stimulatory effect on growth of neighbouring plant species and microorganisms. So the study of phytochemicals and their biochemical interactions causing stimulation or suppression of germination of neighbouring plant is important. The study of such inhibitory effect and its mechanism is called allelopathy.

The term 'Allelopathy' was first time coined by German plant physiologist Hans Molisch in 1937 during his work on the beneficial and deleterious chemical interactions of plants and microorganisms (Willis, 1985) [5]. Allelochemicals are one of the best substitutes for synthetic harmful herbicides and weedicides as they do not have toxic effects to environment, although their efficiency and specificity has been not explained yet (Bhadoria, 2011) [4]. The recent frontier is the usage of allelopathic potential in sustainable weed management. This paper reviews the comparative analysis of allelopathic potential of hexane and ethyl acetate fraction of crude extract of stem, root and seeds of *Albizia lebbek* against radish seed germination. Furthermore, it points out to present conclusions regarding the application of allelopathy in agricultural management and for further research.

2. Materials and Methods

1. Extraction and preparation of fractions/extract from stem and test solutions for screening of allelopathic activity

The shadow dried chopped pieces of stem of *Albizia-lebbek* (3.0 kg) were taken into round bottom flask (5 lit.) and extracted with hot methanol for six hours. The solvent was removed to get extractives. The procedure was repeated thrice. The extractives were concentrated over water bath under reduced pressure to obtain the viscous mass. This viscous crude extract of stem of *Albizia-lebbek* was mixed with silica gel (60-120 mesh) and fractionated successively (the solvent was mixed with extract and kept for six hours) with different solvent viz. hexane and ethyl acetate. The procedure was repeated four times. The fractionated solvent concentrated on water bath under reduced pressure to obtain the viscous mass. The viscous mass thus obtained was the fraction of respective solvent. Crude extract and all obtained fractions were evaluated for their allelopathic activity.

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2. Extraction and Preparation of fractions/extract from root and test solutions for screening of allelopathic activity

The shadow dried chopped pieces of root of *Albizia-lebbek* (3.0 kg) were taken into round bottom flask (5 lit.) and extracted with hot methanol for six hours. The solvent was removed to get extractives. The procedure was repeated thrice. The extractives were concentrated over water bath under reduced pressure to obtain the viscous mass. This viscous crude extract of root of *Albizia-lebbek* was mixed with silica gel (60-120 mesh) and fractionated successively (the solvent was mixed with extract and kept for six hours) with different solvent viz. hexane and ethyl acetate. The procedure was repeated four times. The fractionated solvent concentrated on water bath under reduced pressure to obtain the viscous mass. The viscous mass thus obtained was the fraction of respective solvent. Crude extract and all obtained fractions were evaluated for their allelopathic activity.

3. Extraction and Preparation of fractions/extract from seeds and test solutions for screening of allelopathic activity

The shadow dried chopped pieces of seeds of *Albizia-lebbek* (3.0 kg) were taken into round bottom flask (5 lit.) and extracted with hot methanol for six hours. The solvent was removed to get extractives. The procedure was repeated thrice. The extractives were concentrated over water bath under reduced pressure to obtain the viscous mass. This viscous crude extract of seeds of *Albizia-lebbek* was mixed with silica gel (60-120 mesh) and fractionated successively (the solvent was mixed with extract and kept for six hours) with different solvent viz. hexane and ethyl acetate. The procedure was repeated four times. The fractionated solvent concentrated on water bath under reduced pressure to obtain the viscous mass. The viscous mass thus obtained was the

fraction of respective solvent. Crude extract and all obtained fractions were evaluated for their allelopathic activity.

A stock solution of 2000ppm of each fraction / extract were prepared in minimum amount of acetone and made up with distilled water. Further dilutions of 1500ppm, 1000ppm, 500ppm and 100ppm were made up from that stock solution for analyzing their allelopathic activity.

3. Experimental section

Allelopathy Test

The seeds were surface sterilize in 95% ethanol for 15 seconds and sown in Petri plates of 90 mm diameter. In each Petri plate, ten seeds were taken. The Petri plates were layered with two ordinary filter papers each on with 7 ml of test solutions of different compounds of varying concentrations (100ppm, 500ppm, 1000ppm, 1500ppm and 2000ppm) were poured. A mixture of distilled water: ethanol (30: 1, 7 ml) was taken as control. Three replicates of each concentration were taken.

The radish (*Raphanus sativus* L.) seeds selected for activity analysis were collected from Kisan Seva Kender CCSHAU, Hisar. The variety of the seeds used was spheda. The investigations were carried out in the Department of Chemistry. The radish seeds were allowed to germinate at 25 °C in incubator with 12 hours of photoperiod. After 120 hours, the number of seeds germinated in each Petri plate were counted and percent seed germination inhibition values were calculated (Feo, 2003) ^[8].

Allelopathic activity of hexane fraction

Hexane fraction of stem, root and seeds of *Albizia-lebbek* were tested for their allelopathic activity against the germination of seeds of radish at 100, 500, 1000, 1500 and 2000ppm concentration. The data of activity presented in table 1.1.

Table 1.1: Allelopathy activities of hexane fractions of stem, root and seeds of *Albizia lebbek* L. Benth.

Fraction Type	Concentration (in ppm)	Germination (%)	Inhibition (%)
Hexane Fraction of Stem	100	100	0
	500	100	0
	1000	93.0	7.0
	1500	89.0	11.0
	2000	84.5	15.5
Hexane Fraction of Root	100	100	0
	500	100	0
	1000	97.5	2.5
	1500	95.0	5.0
	2000	90.0	10.0
Hexane Fraction of Seeds	100	100	0
	500	95.5	4.5
	1000	91.0	9.0
	1500	83.3	16.7
	2000	80.5	19.5
	Control	100	0

Allelopathic activity of ethyl acetate fraction

Ethyl Acetate fraction of stem, root and seeds of *Albizia-lebbek* were tested for their allelopathic activity against the

germination of seeds of radish at 100, 500, 1000, 1500 and 2000ppm concentration. The data of activity presented in table 1.2.

Table 1.2: Allelopathy activities of ethyl acetate fractions of stem, root and seeds of *Albizia lebbek* L. Benth.

Fraction Type	Concentration (in ppm)	Germination (%)	Inhibition (%)
Ethyl Acetate Fraction of Stem	100	100	0
	500	100	0
	1000	95.5	4.5
	1500	89.5	10.5

	2000	82.0	18.0
Ethyl Acetate Fraction of Root	100	100	0
	500	100	0
	1000	95.0	5.0
	1500	91.5	8.5
	2000	86.6	13.4
Ethyl Acetate Fraction of Seeds	100	100	0
	500	100	0
	1000	100	0
	1500	92.3	7.7
	2000	90.5	9.5
	Control	100	0

Allelopathic activity of crude methanol extract

Crude methanol extract of stem, root and seeds of *Albizia-lebbek* were tested for their allelopathic activity against the

germination of seeds of radish at 100, 500, 1000, 1500 and 2000ppm concentration. The data of activity presented in table 1.3.

Table 1.3: Allelopathy activity of crude methanol extract of stem, root and seeds of *Albizia lebbek* L. Benth.

Extract/fraction Type	Concentration (in ppm)	Germination (%)	Inhibition (%)
Crude methanol extract of Stem	100	100	0
	500	100	0
	1000	100	0
	1500	88.5	11.5
	2000	84.0	16.0
Crude methanol extract of Root	100	100	0
	500	96.5	3.5
	1000	94.5	5.5
	1500	91.0	9.0
	2000	90.0	10.0
Crude methanol extract of Seeds	100	100	0
	500	100	0
	1000	96.5	3.5
	1500	87.5	12.5
	2000	84.0	16.0
	Control	100	0

4. Result and Discussion

Allelopathy activity

The data of activity presented in table 1.1 revealed that maximum allelopathic effect i.e. 19.5% was shown by hexane fraction of seeds at 2000ppm followed by same fraction of seeds at 1500ppm i.e. 16.7%. Hexane fraction of stem showed 15.5% inhibition at 2000ppm concentration followed by hexane fraction of stem i.e. 11% at 1500ppm concentration successively followed by hexane fraction of root i.e. 10.0%. Among these fractions, hexane fraction of root was found least allelopathic against germination of radish seeds.

The data of activity presented in table 1.2 showed that maximum allelopathic effect i.e. 18% was shown by ethyl acetate fraction of stem at 2000ppm followed by same fraction of root at 2000ppm i.e. 13.4%. Ethyl acetate fraction of stem revealed 10.5% inhibition at 1500ppm concentration followed by similar fraction of seeds i.e. 9.5% at 2000ppm concentration. Ethyl acetate fraction of seeds followed by similar fractions of bark and leaves at low concentration i.e. 100ppm and 500ppm were found least active against germination of seeds of radish.

The data of activity presented in table 1.3 revealed that maximum allelopathic effect i.e. 16% was shown by crude methanol extract of both i.e. stem and seeds at 2000ppm followed by similar extract of seeds at 1500ppm i.e. 12.5%. Crude extract of stem showed 11.5% inhibition at 1500ppm concentration followed by similar extract of root i.e. 10.0% at 2000ppm concentration. Crude methanol extract of stem and seeds, both at low concentration i.e. 100ppm and 500ppm were found least active against germination of seeds of radish.

The comparison has been made between hexane and ethyl acetate fractions of different plant parts viz. stem, root and seeds of *Albizia-lebbek*. Hexane fraction of seeds of *Albizia-lebbek* was found most effective allelopathic at higher concentration i.e. 2000ppm followed by methanolic crude extracts of seeds and stem. The above discussed data and result showed a comparative study of different extract/fractions i.e. methanolic crude extract and hexane, ethyl acetate fractions at different concentration and found that ethyl acetate fraction of seeds has least allelopathic potential and hexane fraction of seeds of *Albizia lebbek* has maximum allelopathic potential against the germination of seeds of *Raphanus sativus* L. (Radish).

5. References

1. Kumar A, Saluja AK, Shah UD, Mayavanshi AV. Pharmacological potential of *Albizia lebbek*: A Review. Pharmacognosy Reviews. 2007, 1:171-174.
2. Mishra LN, Dixit AK, Wagner H. N-De-methyl budmunchiamines from *A. lebbek* seeds. Phytochemistry, 1995; 39(1):247-49.
3. Uddin MB, Ahmed R, Mukul SA, Hossain MK. Inhibitory effects of *Albizia lebbek* leaf extracts on germination and growth behavior of some popular agricultural crops. Journal of Forestry Research. 2007; 18(2):128-132.
4. Bhadoria P, Allelopathy: a natural way towards weed management. American Journal Exp. Agric. 2011; 1:7-20.

5. Willis RJ. The historical bases of the concept of allelopathy. *Journal of the History of Biology*. 1985; 18:71-102
6. Chopra RN, Badhwar RL, Ghosh S. Poisonous Plants of India. 1984; 1:352.
7. Parvin R, Shapla TL, Amin MHA. Allelopathic Effects of *Albizia lebbek* on Agricultural Crops. *Int. J Sustain. Crop Prod*. 2011; 6(1):50-57.
8. Feo VD, Martino LD, Quaranta E, Pizza C. Isolation of phytotoxic compounds from tree of Heaven (*Ailanthus altissima*) (Swingle), *J Agric. Food Chem*. 2003; 51:1177-1180.