



Anticonvulsant Activity of Leaf Extracts of *Albizia lebbek* Linn in Experimental Rats

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ABSTRACT

Albizia lebbek Linn (Fabaceae) is a medicinal herb used in the traditional health care system of Uttara khand (India). The present study reports the anticonvulsant activities in the ethanolic extracts of the leaves of *Albizia lebbek* Linn on the rats, induced both chemically and electrically. The models chosen for the activity were Maximal Electroshock (MES) and Pentylentetrazole (PTZ) induced convulsions in rats. The test dose studied were 200 and 400 mg/kg body weight orally of ethanolic extract of the plant. Acute toxicity studies show that the extract was nontoxic up to the recommended dose 2000mg/kg body weight orally as per OECD guideline no 423. In PTZ induced seizures, onset of clonic convulsions were studied while in MES model, reduction in the mean duration of extensor phase was noted. The ethanolic extracts showed anticonvulsant activities against both MES and PTZ animal models.

Keywords: *Albizia lebbek*, Anticonvulsant activity, MES, PTZ.

INTRODUCTION

Epilepsy has become one of the most prevailing disorders. Epilepsy is the term which is used for a group of disorders that is featured by recurrent spontaneous seizures. This involves many neurotransmitters. According to WHO, a large population in the world have suffered mental, neurological or behavioral problems.¹

Various conventional antiepileptic drugs are available for quite a long. There are lot many limitations of conventional dosage forms; few of them are as below:

- Poor patient compliance.
- Fluctuations in drug concentration may cause a significant difference in drug medication.
- Side effects associated with it, like chronic toxicity, teratogenicity, adverse events on cognition and behavior etc.²

To overcome these issues, researches have focused on to herbal medicines which are the oldest form of health care systems. For times long we have been talking about that plants give us food, shelter, clothing etc, but now this approach is more oriented to obtaining medicines.

The basic cause of seizures which could be explained is an imbalance between the excitatory and inhibitory neurotransmitters.^{3,4}

At neuronal level, seizures often occur when glutaminergic excitatory neurotransmitters overrides gamma amino butyric mediated inhibition.⁵ The most popular and widely used animal seizure models are traditional PTZ and MES tests. Prevention of seizures

induced by PTZ to laboratory animals is the most commonly used preliminary screening test for characterizing potential anticonvulsant drugs. The MES test is considered to be the predictor of likely therapeutic efficacy against generalized tonic clonic seizure.⁶ Generally compounds with anticonvulsant activity in petit mal are effective in PTZ induced seizure model. The MES model is used to identify compounds which prevent seizure spread.⁷

Albizia lebbek is a species of *Albizia*, native to tropical southern Asia, and widely cultivated in other tropical and subtropical regions. English names for it include Lebbek, Lebbek Tree, Flea Tree, Frywood, Koko and Woman's tongue tree. The latter name is a play on the sound the seeds make as they rattle inside the pods. Being one of the most widespread and common species of *Albizia* worldwide, it is often simply called "siris". It is a tree growing to a height of 18–30 m tall with a trunk 50 cm to 1 m in diameter. The leaves are bi pinnate, 7.5–15 cm long, with one to four pairs of pinnae, each pinna with 6–18 leaflets. The flowers are white, with numerous 2.5–3.8 cm long stamens, and very fragrant. The fruit is a pod 15–30 cm long and 2.5-5.0 cm broad, containing six to twelve seeds. It's use includes environmental management, forage, medicine and wood. Lebbek is used as an astringent, to treat boils, cough, to treat eye flu, gingivitis, lung problems, pectoral problems, used as a tonic, and to treat abdominal tumors. The bark of this tree is used medicinally to treat inflammation. *Albizia lebbek* is also psychoactive. It has been reported that *Albizia lebbek* is used as antiasthmatic, anti-inflammatory, antifertility, antidiarrhoeal.⁸ A researcher



reported antiarthritic and anti-oxidant activity of *Albizia lebbbeck*. He also stated that it has anti-inflammatory activity.⁹ Antimicrobial activity has been reported of *Albizia lebbbeck* against infectious diarrhoea. The researcher carried out *in-vitro* antimicrobial study of various extracts of *Albizia lebbbeck*. Activity was performed by disc diffusion method. It was concluded that aqueous, methanolic and chloroform extracts exhibited activity against *E.coli* and Salmonella species.^{10,11}

MATERIALS AND METHODS

The leaves of *Albizia lebbbeck* Linn were collected from field areas of Srinagar Garhwal, Uttarakhand, India. They were identified and authenticated by Dr Sarita Garg, NISCAIR, Delhi as *Albizia lebbbeck* Linn. The voucher specimen bearing No NISCAIR/RHMD/2013/2190/196/1 was deposited at the herbarium.

Preparation of the extract

The collected leaves were cleaned, shade dried, powdered and sieved. A weighed quantity of powder (500 gm) was subjected to successive hot percolation in soxhlet apparatus. Plant material was defatted by petroleum ether before extraction in ethanol. Ethanol was evaporated using rotary evaporator under reduced pressure. The extract was concentrated under reduced pressure using rotary evaporator to obtain a dark green coloured residue.

Preliminary Phytochemical Studies

The phytochemical examination of ethanolic extracts of *Albizia lebbbeck* Linn was performed by the standard methods.¹²

Animals used

Wistar rats (150 – 250 gm) of either sex were obtained from the animal house of NKBR College of Pharmacy and Research Centre Meerut, India. The animals were maintained in a well ventilated room with 12: 12 hour light/ dark cycle in polypropylene cages. All the animals were allowed for free access to water and fed with standard commercial pelleted mice chaw. All the experimental procedures and protocols used were reviewed by Institutional animal ethical committee (IAEC).

Acute toxicity studies

The acute toxicity studies of ethanolic extracts were determined in mice. The animals were fasted overnight prior to the experiment. The extracts were administered in doses 50, 300, 1000, 2000 mg/ kg b.w p.o to different groups of mice each containing 6 animals and mortality was observed after 24 hrs. The ethanolic extracts of *Albizia lebbbeck* leaves were devoid of mortality in animals at dose of 2000mg/kg in mice p.o and hence LD₅₀ was selected as cut value. Subsequent to administration of drug extracts, animals were observed closely for three

hours, for any toxic manifestations, like increased motor activity, salivation, clonic convulsion, coma and death. The animals were under further investigation up to a period of one week. It was observed that the test extracts were not mortal even at 2000mg/ kg dose. This was as per OECD guideline no 423.¹³

Maximal electro convulsive shock (MES)

Rats were divided into four groups of six animals each. The first group received vehicle control (1ml/100gm PEG 400 p.o), group II received standard drug (Phenytoin, 25 mg/ kg ip), group III and IV received ethanolic (EAL) extracts of *Albizia lebbbeck* 200 and 400 mg/kg b.w, p.o respectively. The time for the extracts to reach its maximum effect was determined 60 min after oral administration. The response of the anticonvulsant effect was the abolition of hind limb extensor phase.¹⁴

Pentylene tetrazole (PTZ) induced convulsions

Rats were divided into four groups of six animals each. The first group received vehicle control (1ml/100gm PEG 400 p.o), group II received standard drug (Diazepam, 4 mg/ kg ip), group III and IV received ethanolic extracts of *Albizia lebbbeck* 200 and 400 mg/kg bw, p.o. After 30 min of the dosage of standard and test extracts, PTZ (90 mg/kg b.w s.c) was given and response for the time of onset of seizures (tonic clonic convulsions) and their duration were recorded.^{15,16}

Statistical analysis

The data were expressed as mean \pm standard error mean (SEM). The significance of differences among groups was assessed using one way analysis of variance (ANOVA). The test followed by Dun net's test and P value less than 0.05 was considered significant.¹⁷

RESULTS AND DISCUSSION

Phytochemical Screening

Ethanolic extract of *Albizia lebbbeck* Linn reveals the presence of steroids, glycosides, tannins, carbohydrate, phenol, flavonoid, anthocyanin, oleic acid.

Assessment of anticonvulsant activity by MES

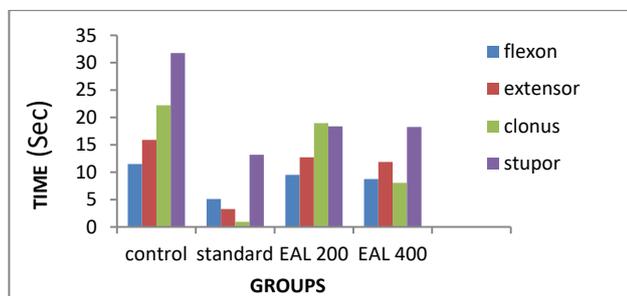
In MES model, the duration of tonic extension of hind limb is used as an end point i.e. the protective action. The result of anticonvulsant effects of *Albizia lebbbeck* plant against MES induced convulsion are shown in table 1. The data shows that the extract reduced the hind limb extension in a dose dependent manner. Ethanolic extracts of *Albizia lebbbeck* (EAL) 200 and 400 mg/kg decreases the duration of hind limb extensor in 12.7 \pm 0.31 and 11.883 \pm 0.33sec respectively which is most significant as compared to control 15.9 \pm 0.21sec.



Table 1: Effect of *Albizia lebbek* extract on MES induced seizures in rats.

Treatment	Flexon	Extensor	Clonus	Stupor	% protection
Control	11.5±0.24	15.9±0.21	22.23±0.37	31.76±0.45	0
Standard	5.11±1.0**	3.28±1.6**	0.93±0.32**	13.18±0.51**	100
EAL 200	9.5±0.183**	12.7±0.31*	18.967±0.243**	18.383±0.183**	66
EAL 400	8.75±0.214**	11.883±0.33**	8.05±0.225**	18.25±0.112**	83

Values are expressed as mean ± SEM of six observations ; *p<0.05; ** p<0.01.Comparison between Group I Vs Group II, Group III &Group IV; Statistical significant test for comparison was done by ANOVA, followed by Dunnet's test.

**Figure 1:** Effect of *Albizia lebbek* extract on MES

Assessment of anticonvulsant activity by PTZ

The anticonvulsant property of different extracts of *Albizia lebbek* is assessed by its ability to delay the onset of myoclonic spasm and clonic convulsion. The results of anticonvulsant effects of *Albizia lebbek* plant against PTZ induced convulsion are shown in table 2. Ethanolic extracts of *Albizia lebbek* at doses of 200 and 400 mg/kg p.o shows onset of convulsions after 371±4.7 and 429.8±6.3 sec respectively which is significant (p<0.01) when compared to control 184.66±2.906 sec.

Table 2: Effect of *Albizia lebbek* extract on PTZ induced seizures in rats

Treatment	Onset of convulsions (sec)	Duration of convulsions (sec)	% N/F
Vehicle control	184.6±2.906	80.6±2.0	33
Diazepam	691.66±5.998**	11.16±0.87**	100
EAL 200	371±4.7*	40.3±2.8**	50
EAL 400	429.8±6.3*	39.5±2.2*	67

Values are expressed as mean ± SEM of six observations; *p<0.05; ** p<0.01.Comparison between Group I Vs Group II, Group III &Group IV; Statistical significant test for comparison was done by ANOVA, followed by Dunnet's test.

As indicated from fig 1, the maximum reduction of hind limb extensor was observed in EAL 400mg/kg b.w (11.883±0.33sec) which was better than the control (15.9±0.21).

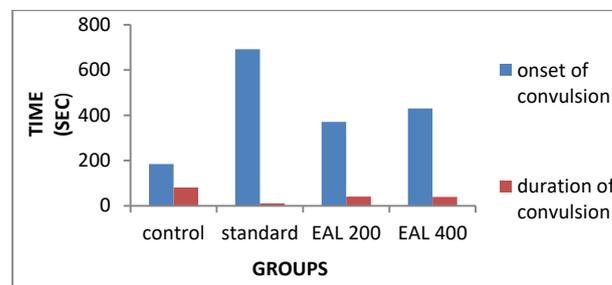
**Figure 2:** Effect of *Albizia lebbek* extract on PTZ

Fig 2 shows that the onset of convulsions were delayed maximum in EAL 400mg/kg having values of 429.8±6.3sec which is ahead of control having values of 184.6±2.906sec.

CONCLUSION

In the present study anticonvulsant activity of ethanolic extracts of *Albizia lebbek* leaves was investigated by means of PTZ and MES models. The oral administration of the extract of *Albizia lebbek* showed delayed onset of convulsions in PTZ model while reduction in tonic hind limb extension in MES model, indicating its potent anticonvulsant activity. Higher protection was observed with higher dose i.e. 400mg/kg b.w orally. The percentage protection of ethanolic extracts of *Albizia lebbek* at a dose of 400 mg/kg orally was found to be 83% and 67% in MES and PTZ models respectively as compared to 100% in case of standard. The extracts showed dose dependent protection in rats. The results demonstrate the broad and potent anticonvulsant activity (both MES and PTZ models) of ethanolic extract of the leaves of *Albizia lebbek* in rats. Development of anticonvulsants from ethanolic extract may produce natural antiepileptic drugs.

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