



ANTICONVULSANT STUDY OF *PONGAMIA PINNATA* LINN AGAINST PENTYLENETETRAZOLE INDUCED CONVULSION IN RATS

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ABSTRACT

The purpose of this study is to explore the anticonvulsant effect of the leaf extract of *Pongamia pinnata* using pentylene tetrazole induced convulsion (PTZ) in rats. *Pongamia pinnata* is an indigenous plant belonging to the family Fabaceae (Papilionaceae) commonly known as Karanj. Freshly powdered leaves were extracted with 70% ethanol. The convulsion is induced by administration of pentylene tetrazole (80 mg/kg, i.p.) to wistar albino rats and those showing response were divided into three groups of six animals each. The group I treated with 1% normal saline (1ml/100gm, orally), Groups II treated with phenytoin sodium (25 mg/kg, i.p.) and Groups III treated with ethanolic extract of PPLE at a dose of (250 mg/kg, i.p.). The ethanolic extract showed significant anticonvulsant activity by lowering the duration of extension phase (3.72 ± 0.65) when compared to control group (8.94 ± 0.42). From the experiment we can say *Pongamia pinnata* had significant anticonvulsant activity.

KEYWORDS

Pongamia pinnata, Phenytoin sodium, Pentylenetetrazole induced convulsion, anticonvulsant activity

INTRODUCTION

Herbal remedies have been recommended in various medical treatises for the cure of different diseases. *Pongamia pinnata* (Synonyms: *Derris indica*, Bennett, *Pongamia glabra* Vent, *Pongamia pinnata* Merr.) belonging to the family Fabaceae (Papilionaceae) commonly known as Karanj. It is a small evergreen tree, which is widely distributed in India, China, Bangladesh and Australia. It has been recognized in different system of traditional medicines for the treatment of different diseases and ailments of human beings^{1, 2}. It contains several phytoconstituents belonging to category flavonoids and fixed oils. The fruits and sprouts of *Pongamia*

pinnata were used in folk remedies for tumors³. Seed extract of this plant has hypotensive effects and produce uterine contractions. Powdered seed is used in bronchitis, chronic fever, whooping cough and chronic skin diseases and painful rheumatic joints⁴. Seed oil is used in scabies, leprosy, piles, ulcers, chronic fever, lever pain and lumbago. Its oil is a source of biodiesel. It has also alternative source of energy, which is renewable, safe and non-pollutant. Leaves are active against *Micrococcus*; their juice is used for cold, cough, diarrhoea, dyspepsia, flatulence, gonorrhoea and leprosy. Roots are used for cleaning gums, teeth and ulcers. Bark is used internally for bleeding piles. Juices from the plant as well as oil are antiseptic. In the traditional systems



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of medicines, such as Ayurveda and Unani, the *Pongamia pinnata* plant is used for anti-inflammatory⁵, anti-plasmodial, anti-nociceptive, anti-hyperglycaemics, anti-lipidoxidative, anti-diarrhoeal, anti-ulcer, anti-hyperammonic, CNS depressant activity⁶ and antioxidant.

MATERIALS AND METHODS

Plant Material

Mature green leaf of *Pongamia pinnata* (L.) Pierre was collected from the Coimbatore District, Tamil Nadu, India. The plant was identified and authenticated at the Herbarium of Botany Directorate in Annamalai University. A voucher specimen (No.3670) was deposited in the Botany Department of Annamalai University.

Preparation of Pongamia pinnata leaf extracts (PPLE)

Fresh leaf was collected and air dried in shade at room temperature. Dried leaves were powdered mechanically through mesh sieve. 100 g of freshly powdered leaves were evenly packed in soxhlet apparatus and the extraction was done with 70% ethanol. Then solvent was evaporated at low temperature under reduced pressure. In the preliminary phytochemical screening, the ethanolic extract of PPLE gave positive tests for glycosides, sterols, tannins and flavones. The residual extract was dissolved in sterile water and used for investigation⁷.

Experimental Animals

18 adult male albino wistar rats, weighing 150-200 gm, were procured from the Departmental animal house, SASTRA Deemed University, Thanjavur, India. The animals were housed in polycarbonate cages in a room with a 12 h day-night

cycle, temperature of $22 \pm 2^\circ\text{C}$ and humidity of 45-64%. During the whole experimental period, animals were fed with a balanced commercial diet and water *ad libitum*. The experimental study was conducted after obtaining animal ethical committee approval from the Institutional Animal Ethical Committee bearing the Ref. No. 817/08/ac/CPCSEA.

Experimental design

The anticonvulsant activity of *Pongamia pinnata* leaf extracts was evaluated for pentylenetetrazole induced convulsion (PTZ) in rats⁸. The convulsion is induced by administration of pentylenetetrazole (80 mg/kg, i.p.) to wistar albino rats. Rats those showing response were divided into three groups of six animals each. The first group of animals were administered 1% normal saline (1ml/100gm) orally which served as negative control. Group of II animals were treated with phenytoin sodium (were obtained from Merck, India) (25 mg/kg, i.p.) which served as positive control⁹. Group of III animals were treated with ethanolic extract of PPLE at a dose of (250 mg/kg i.p.). Drug pretreatment was given 1 hr prior to the administration of pentylenetetrazole and each animal were placed in individual plastic cage and observed initially 30 min. and later up to 24 hrs for the duration of tonic, flexion, tonic extension, clonus and death/recovery.

Statistical analysis

Statistical analysis was done by one-way analysis of variance (ANOVA) followed by Student's t-test. Results are expressed as means \pm SEM from six rats in each group. P values <0.001 were considered significant¹⁰.



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RESULTS

Pongamia pinnata leaf extract was subjected for anticonvulsant effect using PTZ induced convulsion model in rats. PPLE exhibit significant anticonvulsant activity by lowering the duration of

extension phase when compared to control group. The duration of tonic and hind limb extension in rats with 70% ethanolic extract was 3.72 ± 0.65 at a dose 250 mg/kg. The activity of ethanolic extract was comparable ($P < 0.001$) to that produced by standard drug phenytoin sodium (Table 1).

Table 1
Anticonvulsant activity of Pongamia pinnata leaf extract on Pentylenetetrazole induced convulsion in rats

Treatment	Dose	Time in seconds of various phase of convulsion				Recovery/Death
		Flexion	Extension	Convulsion	Stupor	
Control (normal saline)	1ml/100gm orally	3.83 ± 0.36	8.94 ± 0.42	4.65 ± 0.71	104.10 ± 8.74	Recovery
Phenytoin sodium	25 mg/kg ip	2.15 ± 0.21	–	7.86 ± 0.35	91.55 ± 5.85	Recovery
Ethanolic extract	250mg/kg ip	1.90 ± 0.25	$3.72 \pm 0.6^*$	8.96 ± 2.00	102.00 ± 8.75	Recovery

Data are expressed in mean \pm SEM, n = 6 in each groups

* $P < 0.001$ vs Phenytoin sodium – treated rats by student's t-test.

DISCUSSION

Pentylenetetrazole is a selective blocker of the chloride ionophore complex to the GABA-A receptor, and after repeated or single dose administration leads to a decrease in GABAergic function and to the stimulation and modification of density or sensitivity of different glutamate receptor subtype in many brain regions. Pentylenetetrazole may also trigger a variety of biochemical processes including the activation of the membrane phospholipase, proteases and nucleases. Alteration in membrane phospholipids metabolism cause liberation of free fatty acids, diacylglycerols, eicosanoids, lipid peroxidase and free radicals. The

tonic extensor phase is selectively abolished by the drugs effective in generalized tonic clonic seizure¹¹. Phytochemicals such as quercetin, kaempferol and fixed oils are the active principles responsible for the anticonvulsant activity of *Pongamia pinnata*; it is likely that flavonoidal compounds, present in this plant may be involved in this action. Hence this drug may able to modulate the function of GABA or glutamate receptors¹².

CONCLUSION

The present study indicates that the plant *Pongamia pinnata* has potential anticonvulsant activity against chemically induced convulsion in experimental animals. This activity of plant



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probably due to the compounds present such as quercetin, kaempferol, flavonoidal compounds and fixed oils¹³. So the plant *Pongamia pinnata* uses for both ayurvedic and modern drug development areas because of its phytomedicinal uses.

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