WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 13, 53-64. Review Article ISSN 2277–7105

A REVIEW ON PHYSIOCHEMICAL, PHARMACOGNOSTICAL PHARMACOLOGICAL & ANTICONVULSANT ACTIVITY OF *RAUWOLFIA TETRAPHYLLA* L. (APOCYNACEAE) EXTRACT IN SWISS ALBINO MICE

Dr. Bindu Rathore*[1], Sumit Kumar[2], Meraj Ali[3]

[1]Dean, Department of Pharmacy Major S.D. Singh University, Farrukhabad.

[2]Principal, Dr Anita College of Pharmacy Major S.D. Singh University, Farrukhabad.

[3]Assistant Professor, Dr H R Bachhan College of Pharmacy, Unnao.

Article Received on 26 May 2026,
Article Revised on 16 June 2026,
Article Published on 01 July 2026,

https://doi.org/10.5281/zenodo.21022196

***Corresponding Author**

Dr. Bindu Rathore

Dean, Department of Pharmacy
Major S.D. Singh University,
Farrukhabad.

How to cite this Article: Dr. Bindu Rathore*1, Sumit Kumar2, Meraj Ali3. (2026). A Review On Physiochemical, Pharmacognostical Pharmacological and Anticonvulsant Activity of Rauwolfia Tetraphylla l. (Apocynaceae) Extract in Swiss Albino Mice. World Journal of Pharmaceutical Research, 15(13), 53–64.

ABSTRACT

Objective: The present study is design to evaluate an phytochemical constituents, Pharmacognostical, pharmacological and physiochemical properties evaluation of Rauwolfia tetraphylla leaves. *Rauwolfia tetraphylla* is a plant, potentially applicable in Ayurveda and Unani system of medicine for treatment of various diseases. It was found that the anticonvulsant activity of this plant has not reported earlier. The present manuscript deals he ethanolic leaf extract from the plant Rauwolfia tetraphylla is used to evaluate *anticonvulsant activity* by using maximum electroshock seizure (MES) model and pentylenetetrazole (PTZ) induced seizure model in swiss albino mice. The *ethanolic extract* was also evaluated for *rutin and gallic acid* content by HPTLC Chromatographic studies which is found to be 15.60% and 7.81% respectively. Ethanolic leaf extract (200-600 mg/kg) significantly reduced the duration of seizures induced by maximal electroshock (MES). The same doses also protected animals from pentylenetetrazole-induced tonic seizures. The study demonstrates that Rauwolfia tetraphylla plant leaves has significant anticonvulsant activity. **Conclusion:** The results in the paper show that the *Rauwolfia tetraphylla* leave is a natural antioxidant and can be used for treatment of various diseases.

KEYWORDS: Anticonvulsant activity, Rauwolfia Tetraphylla, photochemical & pharmacological studies.

INTRODUCTION

The interest of human is increased for the use of natural drugs (Pharmacognostical, pharmacological and physiochemical constituent) obtained from plant sources for the treatment of various diseases because of their lesser side effects along with various neurological disorders. It was found that a neurological disorder of CNS which is third most common disease after stroke and Alzheimer's.[1] It is a group of related disorders where a person suffers from recurrent seizures, an abnormal, disorderly discharging of the brain's nerve cells, resulting a temporary disturbance of motor, sensory, or mental function. It is an urgent need to search the medicinal plants that can accelerate beneficial effects in seizures *Rauwolfia* consists of approximately thousand of species, including evergreen trees and shrubs belonging to the family: Apocynaceae and are well known for the presence of Indole alkaloids. *Rauwolfia Tetraphylla* L. a small tree shrub frequently available along with which is popularly used in Ayurvedic Unani system of medicines and are a part of folk remedies of most of the Asian countries.[3] It is commonly known as 'Be still tree" or "Devil-pepper" or in Hindi as Barachandrika and the alkaloids isolated from the plant shows various pharmacological activity such as antipsychotic, antimicrobial, anti-inflammatory, anticancer, antihypertensive, antidiarrhoeal, antioxidant etc.[4] It has been cultivated both as ornamental and in traditional medicine, it is native of tropical America and available as endangered medicinal plant Odisha (India) used in treatment of epilepsy, insomnia, wound, fever, colic & urinary retention in Ayurveda. The present manuscript discus the anticonvulsant efficacy of ethanolic extract of Rauwolfia *tetraphylla* against swiss albino mice.

PHARMACOGNOSTICAL STUDY

Scientific Classification-

Kingdoms	**Plantae**
Bionomical Name	Rauvolfia tetraphylla
Synonyms	Rauvolfia hirsuta
Division	Magnoliophyta
Clade	Asterids, Angiosperms
Order	Gentianales
Genus	Rauvolfia.
Species	Rauyolfia t.

PLANT MATERIALS AND METHODS

The Freah leaves of *Rauwolfia Tetraphylla* were collected from the herbal garden of S.B.S Daddu ji College of Pharmacy, Farrukhabad U.P and These were identified, and authenticated by the scientists of Mr. Dileep Singh, Technician Central Instrumentation Facility (CIF) CSIR- National Botanical Research Institute Lucknow-226001, India. A voucher specimen no (NBRI/CIF/595/2024) has been submitted. It is preserved in for future reference. The solvents and chemical were pure analytical grade.

Reagents, standards and drugs

The drug like Phenytoin Sodium was used as standard anticonvulsant drug commercially purchased from Zydus Cadila Healthcare Limited India, The Pentylenetetrazole was used as standard convulsion producing agent purchase from Ranbaxy India. The other chemicals such as hexane, ethanol, dimethyl sulfoxide (DMSO) were purchased from Merck for extraction and dissolution of sample for dosing to animals.

Preparation of Rauwolfia tetraphylla Leaf Extract

The leaves of *Rauwolfia tetraphylla* were powdered and sheaved, followed by successive extraction of powdered leaves was prepared on the basis of polarity with hexane and with 250ml of 90% ethanol using Soxhlet apparatus at temperature of 50^0 C for 80 h. The extraction process was repeated, till complete extraction and the pooled extract were concentrated under vacuum. The resultant extract was filtered by Whatman filter paper No. 1 and then was dried and concentrated under reduced pressure by using rotator evaporator. The extractive value obtained was approximately 30.12% w/w. The extract was stored cold condition /refrigerator throughout the duration of experimentation process.

Fig. 1: Picture of leaves of Rauwolfia tetraphylla.

PHYTOCHEMISTRY STUDY

TLC Analysis of Rauwolfia Tetraphylla Leaves Extract

Different solvent systems were tried for developing TLC system for identification of constituents in the extract keeping in mind the chemical nature of constituents.

1. Methanol : Hexane: Ethyl acetate (1:3:1)
2. n-butanol: acetic acid: water (4:4:2)
3. Prepare a solution of acetone and methanol. Place just enough of this solution in a TLC jar to cover the bottom of the jar. Tightly cap the jar while it is not in use. Obtain two TLC plates, and in pencil, mark a straight line across the plate 1 cm from the edge. TLC plates were prepared by using silica gel G, and were left for air drying. These Plates were activated by hot air drying in hot air oven at 100^0 C for 1 hr. Extracts from different solvents was spotted on TLC plates. The plates were dried and developed in suitable solvents for rapid screening. The plates were run in the following solvent system and dried at room temperature. Detection of TLC plate was done by Iodine chamber and UV chamber. R_f value of different spots available is calculated by using formula:
4. R_f value = Distance travelled by the solute / Distance travelled by the solvent

This solvent giving maximum resolution and separation of constituents.

Table 1: TLC of Acetone & Ethanol Rauwolfia Tetraphylla Leaves extract.

S. No	Fractions	Solvent system	Detecting agent	colour	Number of spot	RF value of spots
1.	Ethanol	Methanol :Hexane: Ethyl acetate (1:3:1)	Gallic acid	Red, Black, Violet, Green	4	0.82 0.70 0.32 0.22
2.	Ethanol	n-butanol: acetic acid: water (4:4:2)	Rutin	White, Red, Green	2	0.72 0.83 0.32
3.	Acetone	Methanol :Hexane: Ethyl acetate (1:3:1)	Gallic acid	Red, Brown, Green, Black	3	0.84 0.42 0.32 0.25
4.	Acetone	n-butanol: acetic acid: water (4:4:2)	Rutin	White, Green, Brown	3	0.80 0.51 0.26

Table 2: Preliminary photochemical screening of Rauwolfia Tetraphylla Leaves extracts.

Plant constituents test/reagent used	Acetone	Petroleum ether	Methanol	Ethanol	Chloroform
1-Alkaloids					
a-Meyer's reagent	+ve	+ve	+ve	+ve	-ve
b-Dragendroff's reagent	+ve	+ve	+ve	+ve	+ve
c-Hager's reagent	+ve	+ve	+ve	+ve	+ve
d-Wagner 's reagent	+ve	+ve	+ve	+ve	+ve
e-Tannic acid	+ve	+ve	+ve	+ve	+ve
2-Carbohydrate & glycosides					
a-Fehling's solution	-ve	-ve	+ve	+ve	-ve
b-Molish's reagent	-ve	-ve	-ve	-ve	-ve
c-Benidict's reagent	+ve	-ve	+ve	-ve	+ve
d-Barfoed's solution	-ve	-ve	-ve	-ve	-ve
e-Pentosis test	+ve	+ve	+ve	+ve	+ve
3-Anthraquinone glycoside test					
a-Borntrager's test					
b-hydroxi-antraquinone	-ve	-ve	-ve	-ve	-ve
glycoside	-ve	-ve	-ve	-ve	-ve
4-Cardic glycoside test					
a-Raymond's test	-ve	-ve	-ve	-ve	-ve
b-Legal's test	-ve	-ve	-ve	-ve	-ve
c-Bal jet's test	-ve	-ve	-ve	-ve	-ve
5-Saponin -					
a-Saponin test	-ve	-ve	-ve	+ve	+ve
b-Fourth formation test	-ve	-ve	-ve	-ve	-ve
6-Phenolic compound & tannin					
a-Ferric chloride test	+ve	+ve	-ve	-ve	+ve
b-Lead acetate test	-ve	-ve	-ve	-ve	-ve

c-Dilute iodine test	-ve	-ve	-ve	-ve	+ve
7- Amino acid & protien **a-Millon's reagent** **b-Ninhydrin reagent**	 +ve - ve	 +ve -ve	 -ve +ve	 -ve -ve	 -ve -ve
8-Flavonids **a-Alkaline reagent** **b –zinc hydroxide test**	 +ve -ve	 +ve -ve	 +ve -ve	 +ve +ve	 +ve -ve

Table 3: Physicochemical properties of leaves of Rauwolfia Tetraphylla Leaves.

S.No	Property	Unit	Value
1.	State of leave	-	Powder
2.	Colour of leave	-	Green
3.	Total Ash	%	2
4.	Acid value	mgKOH/g	9.53
5.	Iodine value	mgI2/100g	116.51
6.	Moisture content	%	3

High Performance Thin layer Chromatography (HPTLC) Rauwolfia Tetraphylla Leaves

Preparation of working solutions of standard and sample

The working solution of standards (1mg/ml) and samples (10mg/ml) were freshly prepared in methanol. The stock solution of standards 1 mg/mL, were diluted in same solvent to obtain a four working solutions in concentration ranging from 0.1 – 0.4 mg/ml for calibration.

HPTLC procedure for Rauwolfia Tetraphylla Leaves

HPTLC is used for quantitative analysis, about 10µl sample was applied using Camag 100 ml sample syringe (Hamilton, Switzerland) on pre-coated plates with silica gel 60F $_{254}$ of 0.2 mm thickness as 6 mm-wide bands positioned 10 mm from the bottom and 15 mm from side of the plate, using Camag linomat-V automated TLC applicator with nitrogen flow providing a delivery speed of 150ml/s from application syringe which is followed by the application of sample.

Development of plates

The layers were developed in a Camag twin trough glass chamber which was pre-saturated with mobile phase toluene: ethyl acetate: formic acid (7: 2.5: 0.5 v/v). After development of the plate, it was dried and spraying agent anisaldehyde-sulphuric acid was used for derivetization and scanned at 254nm and 366nm. Percentage of rutin and gallic acid was calculated by the formula:[5]

$$\frac{(\text{Sample area} \times \text{standard dilution} \times \text{purity})}{(\text{Standard area} \times \text{sample dilution} \times 100)} \times 100$$

PHARMACOLOGICAL STUDY

Experimental Animals

The swiss albino mice of either sex of body weight (20-30 gm) were obtained from Central Animal House facility Rameshwaram Institute of Pharmacy (Reg.No- 1397/ac/10 CPCSEA).The selected swiss albino mice were randomly distributed in various groups for treatment of standard and sample drugs. They were kept at an ambient temperature of 25±1^{0}C and 45-55% RH in polypropylene cage and acclimatized to laboratory condition for a week before to start the experiment. The experimental protocols were approved by Institutional Animal ethical Committee (IAEC) constitute under Committee for the purpose of Control and Supervision of Experimental Animal (CPCSEA), Govt of India.

Acute study of toxicity

The acute study of toxicity of the ethanolic extract of leaves of *Rauwolfia tetraphylla* was done as per the OECD guideline No.420 (OECD, 2002). The swiss albino mice in three different groups of either sex were weighed and placed under standard condition. Method of CPCSEA was adopted for toxicity studies. The extracts were administered in dose of 50, 300, 1000 and 2000 mg/kg p.o. to different groups of mice each containing 10 animals and mortality were observed after 25 hrs. The ethanolic extract of Rauwolfia tetraphylla extract of mortality of animals at dose of 2000 mg/kg.

Drug Treatment

The swiss albino mice were treated with standardized ethanolic leaf extract of *Rauwolfia tetraphylla* in doses of 200, 400, 600 mg/kg and standard drug Phenytoin sodium in a dose of 25 mg/kg for seven consecutive days. The saline solution was used as control by using electrical (MES) and chemical (PTZ) method.

ANTICONVULSANT STUDY

The Swiss albino mice were divided in group of five and screening of anticonvulsant activity was done by Maximal Electroshock (MES) model and Pentylenetetrazole (PTZ) model.

- **Effect of Rauwolfia Tetraphylla Leaves extract on Maximal Electroshock (MES) induced seizures**

This is the best model for generalized seizures of tonic-clonic type.[6,7] In this model rats receive an electrical shock of 50mA, 50Hz for duration of two seconds to induce seizures by electroconvulsiometer. Swiss albino mice were divided in a group of five (n=6): Group-I,

Group-II, Group-III & Group-IV.Group-V.

Group-I was served as control and received only saline water; Group-II and Group-III and VI get the ethanolic extract of *Rauwolfia tetraphylla* in oral doses of 200, 400, or 600 mg/kg and the Group-V get the standard drug Phenytoin Sodium in a dose of 25 mg/kg) The test extract were administered orally in 2% v/v Tween 80 solution,1 hr prior to induce the convulsion and standard drug (Phenytoin sodium 25 mg/kg) was administered i.p.30 min.before

Convulsions were developed by maximal electroshock (MES) and different phases of the convulsions (flexor, extensor, convulsion, stupor and recovery or death) were observed. HLTE phase was measured as the protection of the convulsion developed by MES model.

- **Effect of extract on Pentylenetetrazole (PTZ) induced seizures**

The standard drug Pentylenetetrazole (PTZ) which is used for generation of seizures was administered in a dose of 60mg/kg i.p 60 minutes before the test drug i.e the ethanolic extract of *Rauwolfia tetraphylla* and the parameter like myoclonic, clonic, and tonic–clonic seizures.[8] and % protection were observed. In this model also swiss albino mice were divided in a group of five (n=6): Group-I, Group-II, Group-III & Group-IV and Group-I is served as control, Group-II and Group-III and Group-IV get the ethanolic extract in a dose of 200, 400, or 600 mg/kg and the Group-V served as standard received Phenytoin sodium 25 mg/kg.

- **Statistical Analysis**

The data obtained by different experimental parameters was statistically evaluated by SPSS software and ANOVA test followed by student's t test ($p<0.05$) was used to find the significance. All observation was expressed as mean± SD and the graph of each data is plotted by Graph Pad Prism software.

RESULTS

- **High Performance Thin layer Chromatography (HPTLC) Rauwolfia Tetraphylla Leaves extract**

The quantification of rutin and gallic acid was done by HPTLC, where mobile phase used was toluene: ethyl acetate: formic acid (7: 2.5: 0.5 v/v) which shows higher resolution spot of the sample against the standards on the HPTLC plate. HPTLC plates are visualized in UV light at 254nm and 366nm wavelength. The identification of rutin and gallic acid in extract

was done by comparison of chromatogram of standard and sample, which was shown to be similar in fig 1. By these studies of HPTLC, the amount of rutin and gallic acid were observed 15.60% and 7.81% respectively.

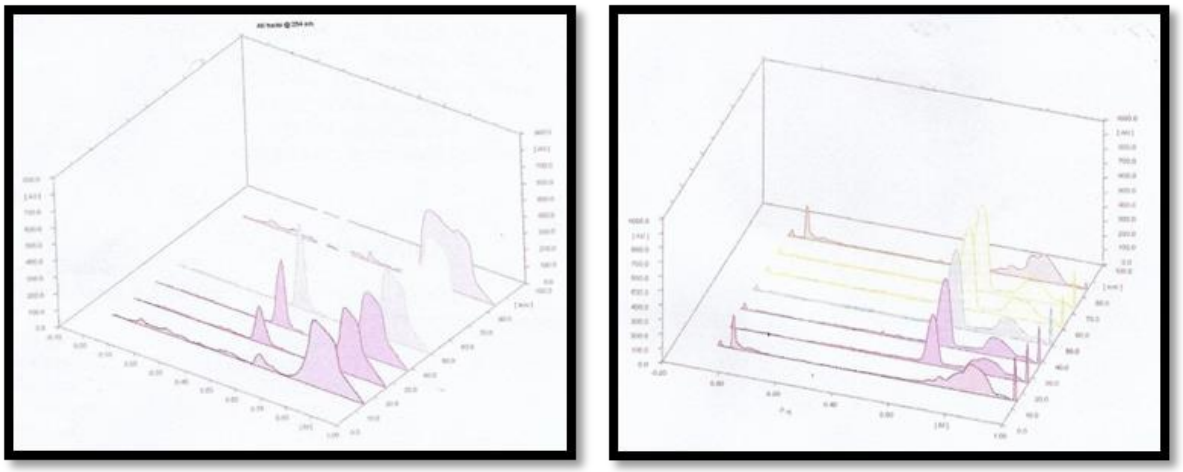

Fig. 3D: Diagram of HPTLC Densitograms for Rutin and Gallic acid respectively.

DISCUSSION AND RESULT

- **Maximal electroshock Test**

MES induced tonic seizures can be prevented either by drugs that inhibit voltage dependant Na+ channels such as Phenytoin, Valproate, Felbamate and Lamotrigine or by drugs that block glutaminergic excitation mediated by the n-methyl-D-aspartate (NMDA) receptor, such as Felbmate. Rauwolfia tetraphylla alcoholic extract may follow any one of the above mechanism. The result of anticonvulsant effect of Rauwolfia tetraphylla leave against MES and PTZ induced convulsions are shown in table 1 and table 2 respectively.

The one way ANOVA analysis of the data observed indicated that alcoholic extract exhibited significant anti-seizure effect against MES and PTZ induced seizures.

Control group animals exhibited hind limb tonic extension (HLTE) of 11.42±0.020 sec.

After the delivery of an electroshock. Ethanolic extract at dose of 200 mg/kg body weight shown very less effect on total duration of HLTE while at the dose of 400 and 600 mg/kg, it reduced the duration of HLTE to 5.19±0.043 and 3.38±0.141 sec. respectively. Statistically significant results were observed with alcoholic extract at the dose of 400 and 600mg/kg with $P<0.01$.

Table 1: It shows effect alcoholic extract against MES induced convulsions Groups Time (sec.) in various phases of convulsions.

Group	Time (sec.) in various phases of convulsions (mean±SEM)				
	Flexion	Extension(HLTE)	Clonus	Stupor	Recovery
Control	3.81±0.014	11.42±0.020	14.07±0.577	92.28±0.106	120.8±1.40
Standard	1.323±0.218**	0.00 sec**	7.77±0.169**	50.69±0.134**	30.32±0.811
RT-200	3.77±0.026	11.48±0.086	13.83±0.205	90.87±.855	118.23±0.700
RT-400	2.67±0.020**	4.38±0.023**	13.49±0.410	89.84±0.622*	98.53±0.232
RT-600	1.62±0.030**	2.65±0.308**	9.29±0.014**	58.05±0.226**	96.78±0.410
RT-200, RT-400, RT-600 –Rauwolfia tetraphylla alcoholic extract dose 200mg/kg, 400mg/kg and 600mg/kg body weight					

Pentylenetetrazole Induced Seizures: In PTZ induced seizures , alcoholic extracts dose 400 and 600 mg/Kg b.w. exhibited delayed onset of clonus 79.05±0.115 and 80.57±0.425 sec. respectively in comparison to control 77.12±0.540 sec. For the extensor phase alcoholic extract dose 400 and 600mg/Kg exhibited 298.51±0.815 and 317.22±0.030 sec. respectively as significant anticonvulsant activity in comparison to control extensor (278.11±0.220sec).

Further more study are however necessary to elucidate the exact mechanism of action and the active.

Principle responsible for above activity

Table 2: It shows effect of alcoholic and aqueous and extract on PTZ induced convulsions.

Drug	Dose (mg /Kg b.w.)	Onset time in seconds (mean±SEM)		
		Jerks	Clonus	Extensor
Vehicle	-	48.72±0.085	77.12±0.540	278.11±0.220
Standard (Phenytoin Na)	25	0.00±0.000**	0.00±0.000**	0.00±0.000**
Alcoholic	200	47.89±0.227	77.97±0.490	280.28±1.045
	400	49.62±0.248	79.05±0.115*	298.51±0.815**
	600	49.78±0332*	80.57±0.425**	317.22±0.030**

Values are mean ± SEM, n=6. ** P<0.01,* P<0.05 significant when compared to control

CONCLUSION

It was found that alcoholic extract of Rawolfia tetraphylla leaves (dose 400 and 600 mg/kg body weight) was having significant activity against MES and PTZ convulsions when compared to control groups.

REFERENCES

1. *Vezzani M, French J, Bartfai T, Baram TZ.* The role of inflammation in epilepsy. Nat Rev Neurol, 2011; 7: 31–40.
2. *Jakaria M D, Tareq S M, Ibrahim M and Bokhtearuddin S.* Rauvolfia tetraphylla L. (Apocynaceae): A Pharmacognostical, Phytochemical and Pharmacological Review, Journal of Chemical and Pharmaceutical Research, 2016; 8(12): 114-120.
3. *Koche D, Shirsat R, Imran S and Bhadange D G.* Phytochemical screening of eight traditionally used ethnomedicinal plants from Akola district (MS) India. International Journal of Pharma and Bio Sciences, 2010; 1: 253-256.
4. *Iqbal A A M, Khan F A K and Khan M,* Ethno-Phyto-Pharmacological Overview on Rauwolfia tetraphylla L., International Journal of Pharmaceutical and Phytopharmacological Research, 2013; 2(4): 247-251.
5. *Doshi G M, Zine S P, P K and Une H D,* Solicitation of HPLC and HPTLC Techniques for Determination of Rutin from *Polyalthia longifolia Thwaites,* harmacognosy Res., 2014; 6(3): 234–239.
6. *Löscher W., Schmidt D.* Which animal models should be used in the search for new antiepileptic drugs? A proposal based on experimental and clinical considerations. Epilepsy Res., 1988; 2(3): 145-81.
7. *White H S,* Preclinical development of antiepileptic drugs: past present and future direction, Epilepsia, 2003; 44(7): 2-8.
8. *Amabeoku GJ, Chikuni O.* Cimetidine–induced seizures in mice. Biochem Pharmacol., 1993; 46(12): 2171-2175.
9. *Vezzani M, French J, Bartfai T, Baram TZ.* The role of inflammation in epilepsy. Nat Rev Neurol, 2011; 7: 31–40.
10. *Jakaria M D, Tareq S M, Ibrahim M and Bokhtearuddin S.* Rauvolfia tetraphylla L. (Apocynaceae): A Pharmacognostical, Phytochemical and Pharmacological Review, Journal of Chemical and Pharmaceutical Research, 2016; 8(12): 114-120.
11. *Koche D, Shirsat R, Imran S and Bhadange D G*. (2010) Phytochemical screening of eight traditionally used ethnomedicinal plants from Akola district (MS) India. International Journal of Pharma and Bio Sciences, 2010; 1: 253-256.
12. *Iqbal A A M, Khan F A K and Khan M,* Ethno-Phyto-Pharmacological Overview on Rauwolfia tetraphylla L., International Journal of Pharmaceutical and Phytopharmacological Research, 2013; 2(4): 247-251.

13. *Doshi G M, Zine S P, P K and Une H D*, Solicitation of HPLC and HPTLC Techniques for Determination of Rutin from *Polyalthia longifolia Thwaites*, harmacognosy Res., 2014; 6(3): 234–239.
14. *Löscher W., Schmidt D.* Which animal models should be used in the search for new antiepileptic drugs? A proposal based on experimental and clinical considerations. Epilepsy Res., 1988; 2(3): 145-81.
15. *White H S*, Preclinical development of antiepileptic drugs: past present and future direction, Epilepsia, 2003; 44(7): 2-8.
16. *Amabeoku GJ, Chikuni O. Cimetidine*–induced seizures in mice. Biochem Pharmacol 1993; 46 (12): 2171-2175.