

**Evaluation of anticonvulsant activity of ethanolic extract of *Momordica tuberosa* leaves in experimental animals****Yasmeen A. Maniyar, Jayapradha Shivanand Totad\***

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**ABSTRACT**

**Background:** The aim of the present study was to evaluate the anticonvulsant activity of ethanolic extract of *Momordica tuberosa* leaves (EEMTL) in a maximal electric shock induced seizure (MES) model in experimental animals.

**Methods:** A total of 30 albino rats of either sex weighing 150-200 g were randomly divided into five groups of six animals each. Group I received normal saline (0.5 ml), Group II received phenytoin sodium (25 mg/kg body weight) intraperitoneal, Group III, IV, V received different doses (100, 200, 400 mg/kg, respectively) of *M. tuberosa* leaves extract orally. Convulsions were produced in all groups by giving maximal electric shock of 150 mA for 0.2 sec after 1 hr of giving test and standard drugs. Tonic-clonic seizures were produced after giving an electric shock. Recovery time was noted. The period of tonus, clonus, and stupor were measured and compared between the control, standard and test.

**Results:** In MES model, EEMTL significantly ( $p < 0.0001$ ) decreased the duration of tonic-clonic seizures and recovery time.

**Conclusion:** *M. tuberosa* leaves were shown anticonvulsant property in MES animal models.

**Keywords:** Convulsions, *Momordica tuberosa*, Phenytoin sodium, Maximal electric shock, Anticonvulsant

**INTRODUCTION**

Epilepsy is a chronic non-communicable disorder of the brain that affects people of all age. Approximately, 50 million people worldwide have epilepsy making it one of the most common neurological disease globally.<sup>1</sup> One seizure does not signify epilepsy. It is defined as having two or more unprovoked seizures. It is characterized by recurrent seizures which are brief episodes of involuntary movement that may involve a part of the body (partial) or the entire body (generalized). Herbal remedies have been recommended in various medicinal treatises for the cure of different diseases. Present anticonvulsant drugs are efficacious in only about 75-80% of cases in general, and they also have their own adverse drug reactions such as gum hypertrophy, hirsutism, osteomalacia, sedation, diplopia, ataxia, and mood changes. In this regard, herbal based medicines are given much importance as they do not produce adverse effects. Hence, there is a need to conduct research for developing more efficacious and safer antiepileptic drugs.

*Momordica tuberosa* (synonyms: *Luffa tuberosa*, *Momordica cymbalaria*) belongs to the family Cucurbitaceae commonly known as *M. cymbalaria*.

**Plant profile**

Family: Cucurbitaceae

Latin name: *M. tuberosa*,

*M. cymbalaria*, *L. tuberosa*

Synonyms: English - Momordica

Hindi - Kakrol

Kannada - Karchikai

Tamil - Athalkkai

Sanskrit - Kaarali Kanda

The plant is originating in tropical regions of India and South East Asia. It is perennial climber available during the monsoon season and is found in south Indian states of Karnataka, Andhra Pradesh, Madhya Pradesh, Maharashtra and Tamil Nadu as a weed. It has slender, scandent, branched,

striate stem. The leaves are orbicular, reniform in outline deeply cordate at the base, sparsely hairy. The roots are woody, tuberous and perennial.<sup>2</sup>

It contains several phyto-constituents such as sterols, saponins, triterpenoids, cardiac glycosides, flavonoids, carbohydrates.<sup>2</sup>

The medicinal properties of various parts of *M. tuberosa* are testified. It possess antidiabetic, hypolipidemic,<sup>3</sup> antiovolatory, abortifacient,<sup>4</sup> antidiarrhoeal,<sup>5</sup> anticonvulsant,<sup>6</sup> antioxidant, hepatoprotective,<sup>7</sup> nephroprotective,<sup>8</sup> antidepressant,<sup>9</sup> antiulcer<sup>10</sup> properties.

The fruits, tubers and leaves of *M. tuberosa* were used in folk remedies for diabetes, inflammatory disorders, malaria, wounds, worms, parasites, ulcers, hepatitis and fever. This fruit extract also used in convulsions.<sup>4</sup>

*M. tuberosa* has been extensively studied for its anti-diabetic, hepatoprotective, antidiarrhoeal in the past. Only a few studies have been conducted to evaluate its anticonvulsant activity of fruits.<sup>6,11</sup> But no studies have been reported on its anticonvulsant property of leaves. Hence, this present study was taken to evaluate its anticonvulsant property in animal models.

## METHODS

### Plant material

Fresh green leaves of *M. tuberosa* popularly known as kasarakai were obtained in sufficient quantity from suburban places of Raichur in the month of August 2014. They were carefully washed to remove dust particles and other foreign materials and dried in shaded area, and it was authenticated by Mr. Harish. B. S. (Assistant Professor, Medicinal and Aromatic Crops) and the specimen (voucher number: SNMC/Pharma 007), is preserved for reference in the Department Herbarium of Pharmacology, SNMC Bagalkot.

### Preparation of plant extract

The leaves of the plant were dried under shade for a period of 2-week. The dried leaves were milled to a fine powder. The material was extracted with 80% ethanol using soxhlet extraction apparatus, and it was evaporated to dry at 60°C. Dried leaves (20 g) of *M. tuberosa* leaves yielded 4 g of crude extract. The solid residues were stored in airtight container and preserved in the refrigerator at -20°C.<sup>12</sup> From this stock, fresh preparation was obtained whenever required.

### Phytochemical analysis

Preliminary phytochemical studies of ethanolic extract of *M. tuberosa* leaves (EEMTL) revealed the presence of flavonoids, triterpenoids, steroids and carbohydrates.<sup>13</sup>

### Acute oral toxicity study

The acute toxicity studies were conducted according to Organization for Economic co-Operation and Development 423 guidelines. The EEMTL found to be nontoxic up to 2000 mg/kg.<sup>13</sup>

### Experimental animals

All the animals were procured from the central animal house, S. N. Medical College, Bagalkot. Wistar albino rats of either gender weighing 150-250 g were selected for the experiment. Pregnant rats, animals with an infection, animals with injuries, deformities were excluded from the study. Prior to and during study, all the animals were maintained under standard animal house conditions at 12:12 hrs dark:light cycle, at temperature 25±2°C, 35-60% humidity and other micro and macro environment conditions as suggested by Committee for the Purpose of Control and Supervision of Experiment on Animals (CPCSEA). All animals were housed in a polypropylene cage covered with a stainless steel wire mesh and a paddy husk bed, with adequate provision for feed and water. All the animals were maintained on standard laboratory diet (VRK Nutritionals, Pune) and water was provided *ad-libitum*.

The study was started after getting the Institutional Animal Ethics Committee Approval (IAEC/SNMC Reg No.829/AC/04/CPCSEA).

### Maximal electro shock induced seizures (MES)

This model was developed by Merritt and Putnam in 1938.<sup>14</sup> This model is helpful in the screening of drugs effective against primary and secondary generalized tonic clonic seizure (GTCS).<sup>14,15</sup>

The animals were divided into five groups with each group consisting of six animals. Group I received normal saline 0.5ml/kg served as control, Group II received phenytoin sodium (25 mg/kg, intraperitoneal [ip]) as standard in MES method. Group III, IV, V were administered three graded doses of test drug (EEMTL), i.e., 100, 200, 400 mg/kg, orally in MES experimental models. In MES model, convulsions were produced in all groups by giving maximal electric shock of 150 mA for 0.2 sec after 1 hr of giving test extract orally and standard drug ip., tonic-clonic seizures were produced after giving electric shock. Time duration (in sec) of each phase, i.e., tonus, clonus, stupor was noted and compared with control

### Statistical analysis

The data were expressed as mean±standard deviation and statically analyzed using one-way analysis of variance followed by Dunnett's multiple comparison tests. For all the tests a p=0.05 or less was considered as a statistical significance.

**Table 1: Anticonvulsant activity of EEMTL in MES induced convulsions in Wistar albino rats.**

Groups	Mean±SD (sec)			Recovery
	Tonus	Clonus	Stupor	
Group I control (normal saline) 0.5 ml/kg	22.4±3.64	18.4±1.34	57.1±3.52	Recovered
Group II phenytoin sodium 25 mg/kg	4.9±1.21**	4.11±0.59**	27.55±4.06**	Recovered
Group III EEMTL 100 mg/kg	17.42±1.54	16.62±1.37	54.09±4.20	Recovered
Group IV EEMTL 200 mg/kg	6.45±0.63**	14.02±1.35**	43.93±5.61**	Recovered
Group V EEMTL 400 mg/kg	4.54±0.72**	12.04±1.44**	35.33±2.74**	Recovered

\*p<0.05 is significant as compared to control (ANOVA followed by Dunnett's multiple comparison test), \*\*p<0.0001, EEMTL: Ethanolic extract of *M. tuberosa* leaves, SD: Standard deviation

## RESULTS

### Acute oral toxicity study

No adverse effect or mortality was detected in Swiss albino mice at 2 g/kg of EEMTL. All the animals were alive, healthy and active during the observational period of 14-day. Hence, the LD 50 was considered as >2000 mg/kg.

### Phytochemical constituents

Preliminary phytochemical studies of EEMTL showed the presence of flavonoids, triterpenoids, steroids and carbohydrates.

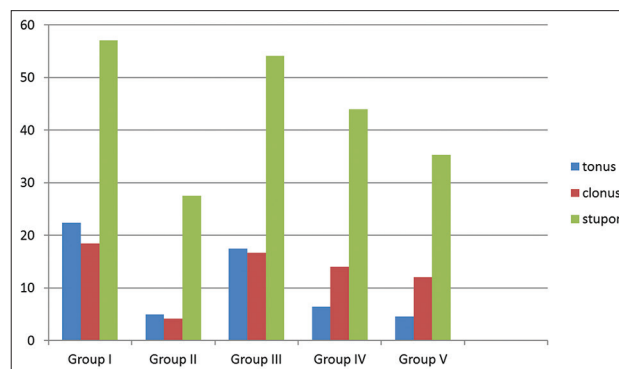
Present study has shown EEMTL when given in a dose of 200 mg/kg and 400 mg/kg significantly reduced duration of hindlimb extension with mean of (6.45±0.63\* and 4.54±0.72\*; p<0.0001), respectively, in MES-induced seizure model (Table 1 and Figure 1) when compared to control (22.4±3.64). Thus EEMTL (200 mg/kg and 400 mg/kg) has protection against MES.

## DISCUSSION

The recent trend in human healthcare is to use more of plant derived products for prevention and therapy of various diseases. Indian herbs have the potential to become the first-line therapies for diseases with unmet medical needs.<sup>16</sup> However, most of the antiepileptic drugs are inaccessible, more costly and possess many toxic adverse effects. In this regard, there is a need for the development of safer, efficacious and more economical anticonvulsant agents from plant and other sources.

In the present study, the anticonvulsant action of *M. tuberosa* leaves extract was evaluated in Wistar albino rats. According to literature, *M. tuberosa* having a number of medicinal properties like antiulcer, anti-diabetic, hepatoprotective, antidiarrhoeal, and antiepileptic property. The previous studies have shown that EEMTL fruits exhibit significant anticonvulsant activity.

In this study, EEMTL at high dose (400 mg/kg) (4.54±0.72\*; p<0.0001) inhibits the type of seizures and shortens the duration of hindlimb extension effectively when compared



**Figure 1: Graph representing anticonvulsant activity of ethanolic extract of *Momordica tuberosa* leaves in maximal electric shock induced seizure induced convulsions in Wistar albino rats.**

with control group. High dose (400 mg/kg) is also more effective as that of standard drug (phenytoin sodium). Based on present study results, we conclude that the EEMTL possesses potent anticonvulsant activity. However, further studies are recommended to know the underlying mechanism of anticonvulsant activity and for isolation of active ingredients of the plant.

## CONCLUSION

Current research proved that EEMTL has shown protection against maximum electroshock seizures induced convulsion. As MES model is useful for screening drugs effective against GTCS, the EEMTL can be considered for further preclinical evaluation to substantiate its use in GTCS. In the present study, the anticonvulsant activity of *M. tuberosa* leaves might be attributed to the presence of flavonoids.<sup>6</sup>

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*Ethical approval: The study was approved by the Institutional Animal Ethics Committee*

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