Original Research Paper

Volume-9 | Issue-5 | May-2019 | PRINT ISSN No 2249 - 555X

General Medicine

SYSTEMATIC EVALUATION OF ETHANOLIC LEAF EXTRACT OF *CARYOTA URENS* ON NERVOUS DISORDERS IN ANIMAL MODELS

Ragul B — Department of General Medicine, Indira Gandhi Medical College and Research Institute, Kathirkamam, Puducherry - 605 009.

Loknath B* — Department of Pulmonary Medicine, Tirunelveli Medical College, Tirunelveli – 627011. *Corresponding Author

Jaikumar S — Department of Pharmacology, Sri Lakshmi Narayana Institute of Medical Sciences, Osudu, Agaram Village, Puducherry - 605 502

ABSTRACT Central nervous system plays a vital role in the physiological organization of the completely human body. In modern world, everyday people suffered by depression, anxiety, epilepsy and restlessness due to stress. According to WHO report, about 450 million people suffer from a mental or behavioral disorder. While, majority of modern drugs synthetic agents causes side effects on like tiredness, weight gain, nausea, dry mouth, sexual dysfunction, amnesia, sedation, headache and wooziness. The affinity towards the herbal drugs has been grown by utilization of traditional medicinal plant due to its safety and better alternative to synthetic drugs that assure numerous side effects during prolonged treatment. Use of herbal medicine has been increased due to its safety and plays vital role in CNS disorders. The urens is the principle phytoconstituent present in the Caryota urens, and others are flavonoids, phenolic compounds, amino acids, alkaloids, proteins and carbohydrate which are medicinally important and responsible for treating various illness including neurological disorders. The study was conducted with an aim, to assess the influence of Caryota urens leaf extract on CNS by evaluating its effect on various neurological disorders in experimental animal models. The CNS activities of dried ethanolic leaf extract of Caryota urens (200 and 400mg/kg) were evaluated using various models for antidepressant activity, anxiolytic activity, locomotor activity and muscle relaxant activity. The ethanolic leaf extract Caryota urens (ELECU) dose dependently increase the number of head dips, which indicate, that the leaves of Caryota urens shows antidepressant activity. ELECU significantly increases both the number of entries and time spent in open arm. Both the doses of ELECU showed mild to moderate decrease in locomotor activity in dose dependent manner. The present study showed a dose-dependent increase in muscle relaxation with both the doses of ELECU. All the CNS mediated effects of ELECU were similar as that of diazepam the standard drug. It is concluded that the ethanolic leaf extract of Caryota urens possess significant CNS effect on various animal models. However, further studies are necessary to examine the underlying mechanisms of CNS effects and to isolate the active compounds responsible for its activity.

KEYWORDS : *Caryota urens*, Antidepressant activity, Anxiolytic activity, Locomotor activity and Muscle relaxant activity.

INTRODUCTION

In recent times the research deal with the effects of plants and their constituents on the Central Nervous System (CNS), relevant to behavioral aspects. It is not easy to know the baseline of human behavior without regular doses of plant extracts as tea, coffee, and chocolate and inhaled volatiles from tobacco, because these are an essential part of life for almost everyone in the developed world and as well in industrially developing communities. Rational treatment of CNS disorders by plant constituents is in its childhood due to the complex chemistry, organization of the CNS, also to the complex between chemistry and pharmacology of a plant extract which may include an incomprehensible variety of chemical compounds. Ethnopharmacology provides clues of plants worthy of exploration which are used in traditional medicine, as poisons and in religious rituals[1]. Earliest pharmacopoeias from various regions of the world comprise of herbal medicines that are supposed to have psychotropic potential; these propose a huge repository of prospective substances that can be developed into psychiatric pharmaceuticals. In fact, almost 25% of today's conventional drugs originated directly or indirectly from plants; several valuable psychoactive drugs, such as Yohimbine, Ephedrine and d-tubocurarine owe their origin to folklore medicines[2]. At present a small number of plant-derived drugs are approved for clinical use. This is mainly because nearly all herbal medicines are complex mixtures of chemical components and have different biological and pharmacological actions.

Considering the restrictions of the available conventional pharmacotherapeutic agents for psychiatric illnesses, high deterioration rates and various adverse side effects that happen through long-standing treatments, herbal remedies could offer a substitute for patients, particularly intended for individuals with enduring circumstances and intolerant to adverse effects. Actually, a number of clinical studies have established the beneficial effects of herbal remedies in the treatment of definite psychiatric conditions, most markedly depression, anxiety, insomnia, and dementia. *Caryota urens* L. is belongs to the family Arecaceae (Palmaceae). These are one of most useful flowering plants to after the grass mankind from time immemorial. The term *Caryota* from the Greek word karyotes, meaning "nutlike." Urens means "burning," *Caryota urens* (Kitul Palm) is also called as Kundalpanai or Thippali or Choondapana in south India. It is widely occurring across South Asia, i.e., India, Sri Lanka, Malaysia and Indonesia to Philippines from up to 2,000 MSL[3]. Ayurveda recommends the use of *Caryota urens* for seminal weakness and urinary disorders, the juice is applied on the forehead for hemicranias. In traditional medicine porridge prepared from *Caryota urens* flower is used to treat malaria, gastric ulcer, migraine headaches, snake bite poisoning, as well as rheumatic swellings[4] (Ambika *et al*,. 2012). Palm heart is used locally as flour, especially for control of diabetes and in ayurvedic medicines. *Caryota urens* species are known as Sugar palm also, which is used in ancient medicine to treat hemicranias and rheumatic swelling. Ancient medicine technologies recommend these flowers of the trees are used as a home remedy and improve the hair growth. The roots of the trees are used as the tooth ailments[5]. The sap of fishtail palm is sweet in nature. So it is used to produce sugar which is known as jiggery. So far there is no scientific evidence for its use in central nervous functions. Current study is aim to assess the influence of *Caryota urens* leaf extract on CNS by evaluating its effect on various neurological disorders in experimental animal models.

MATERIALS AND METHODS

Plant Materials

Collection & Identification

The leaves of *Caryota urens* was collected from outskirts of Pondicherry. The plant was identified as *Caryota urens* and authenticated by the botanist, Botanical Survey of India, Agricultural University, Coimbatore. The voucher specimen (BSI/SRC/11/72/2017-18/Sci/01308) has been deposited in the herbarium for future reference.

Extraction of Plant Material

The collected *Caryota urens* leaves were, shade dried and grounded using mechanical blender to get coarse powder. The 200gm of coarsely powdered leaves of *Caryota urens* was soaked in one litre of ethanol

(70%) in a tightly sealed flat bottom flask at room temperature, protected from sun light for 72 hrs with occasional shaking. After 72 hrs the mixture was filtered through muslin cloth and the solvent was evaporated by rotary evaporator at 40°C to get dry mass. The dried ethanolic leaf extract of *Caryota urens* was stored in desiccators and used for further pharmacological studies.

Animals

The Swiss albino mice (18-22 g) and Wistar albino rats (180-220 g) of either sex were used for the study. The animals were obtained from animal house, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry. On arrival, the animals were placed at random and allocated to treatment groups in polypropylene cages with paddy husk as bedding. Animals were housed at a temperature of 24±2°C and relative humidity of 30 – 70 %. A 12:12 light: day cycle was followed. All animals were allowed to free access to water and fed with standard commercial pelleted rat chaw (M/s. Hindustan Lever Ltd, Mumbai). All the experimental procedures and protocols used in this study were reviewed by the Institutional Animal Ethics Committee (932/a/06/CPCSEA) and were in accordance with the Institutional ethical guidelines.

Experimental Protocol

The animals are divided into four groups of six animals each. Group 1, control animals are administer orally with 10ml/kg of 0.1% Carboxymethylcellulose (CMC) solution and group 2 are reference control animals, receives diazepam (4 mg/kg, i.p). Group 3 and 4 are treated with ethanolic leaf extract of *Caryota urens* (200 & 400mg/kg) respectively through oral route All the test drugs are administer 30 minutes before the commencement of the study.

Antidepressant Activity

Hole-board Test:

The poking of the nose into a hole is the usual behavior of mice indicating the definite degree of curiosity. Twenty four Swiss albino mice were divided into four groups of six animals in each group. Group 1, control animals were administered orally with 10ml/kg of 0.1% Carboxymethylcellulose (CMC) solution and group 2 animals served as reference control, received diazepam (1 mg/kg, i.p). The animals of group 3 and 4 were treated with ethanolic leaf extract of *Caryota urens* (200 & 400mg/kg) respectively through oral route. After the test drug administration animals were placed in the center of the hole-board and allow freely to explore the equipment for 5 min. The number of heads dipping recorded by visual examination. Head dip scored if both eyes disappeared keen on the hole[6].

Anxiolytic Activity

Elevated Plus Maze:

The elevated plus maze test is the most extensively used to access the anxiety that depend upon the study of spontaneous behavior. Twenty four Swiss albino mice were divided into four groups of six animals in each group. Group 1, control animals were administered orally with 10ml/kg of 0.1% Carboxymethylcellulose (CMC) solution and group 2 animals served as reference control, received diazepam (1 mg/kg, i.p). The animals of group 3 and 4 were treated with ethanolic leaf extract of *Caryota urens* (200 & 400mg/kg) respectively through oral route. After treatment with extract, the animals were individually placed in the centre of the elevated plus maze and observed the number of open and closed arm entries and time spent on open and closed arm by the mice[7].

Locomotor Activity:

Actophotometer is used to assess CNS property and motor coordination. Twenty four Wistar albino rats were divided into four groups of six animals in each group. Group 1, control animals were administered orally with 1ml/kg of 0.1% Carboxymethylcellulose (CMC) solution and group 2 animals served as reference control, received diazepam (1 mg/kg, i.p). The animals of group 3 and 4 were treated with ethanolic leaf extract of *Caryota urens* (200 & 400mg/kg) respectively through oral route. After drug administration the animals were kept in actophotometer for 5 min. To prevent any turbulence in the reading of an animal, by the odor of the previous animal, ethanol 5% solution was used to wipe out the surface of activity cage after taking readings from each animal.

Muscle Relaxant Activity

Rota-rod Method:

The test used to evaluate the activity of extracts interferes with motor coordination. Twenty four Swiss albino mice were divided into four groups of six animals in each group. Group 1, control animals were administered orally with 10ml/kg of 0.1% Carboxymethylcellulose (CMC) solution and group 2 animals served as reference control, received diazepam (1 mg/kg, i.p). The animals of group 3 and 4 were treated with ethanolic leaf extract of *Caryota urens* (200 & 400mg/kg) respectively through oral route. After drug administration the animals were individually placed in the rotating rod and the time taken for fall from the rotating rod is counted[8].

Statistical Analysis

Results are expressed as mean ± SEM. The datas are analyzed by using one way analysis of variance (ANOVA) followed by Dunnet's '*t*' test using GraphPad version 3. P values < 0.05 was considered as significant.

RESULTS

Table 1. Effect of Ethanolic Leaf Extract of *Caryota urens* on number of head dips in Hole Board Test in mice

Groups	Drug Treatment	Number of Head Dips in 5 Minutes
I	Control 0.1% CMC (10ml/kg, p.o)	15.50±2.60
II	Diazepam (4mg/kg, i.p)	51.00±3.39***
III	ELECU (200mg/kg, p.o)	39.00±1.51**
IV	ELECU (400mg/kg, p.o)	48.50±1.34***

Values are in mean ± SEM (n=6),
*P<0.05 , **P<0.01, ***P<0.001 Vs Control

The effects of ethanolic leaf extract of *Caryota urens* at two dose levels of 200mg and 400mg/kg on Hole Board test were studied in mice and the results were given in table 1. The number of head dips observed with the ethanolic leaf extract of *Caryota urens* at 200mg and 400mg/kg were 39.00±1.51and 48.50±1.3 4respectively. The study showed that 400 mg of ethanolic leaf extract of *Caryota urens* produced more significant (P<0.001) increase in head dip responses whereas 200mg ethanolic leaf extract of *Caryota urens* showed moderately significant (P<0.01) increase in head dip response compared to control. The standard drug diazepam produced 51.00±3.39 head dips and showed significant (p<0.001) increase in head dip response compared to control. The high dose of ethanolic leaf extract of *Caryota urens* showed equipotent activity as that of Diazepam treated groups.

Table 2. Effect of Ethanolic Leaf Extract of *Caryota urens* on Locomotor Activity using Actophotometer in rats.

Groups	Drug Treatment	Activity Score in Actophotometer
I	Control 0.1% CMC (10ml/kg, p.o)	205.50±2.22
II	Diazepam (4mg/kg, i.p)	93.50±2.57***
III	ELECU (200mg/kg, p.o)	170.83±3.55*
IV	ELECU (400mg/kg, p.o)	155.67±2.60**

Values are in mean ± SEM (n=6),
*P<0.05 , **P<0.01, ***P<0.001 Vs Control

The locomotor activity of ethanolic leaf extract of *Caryota urens* was observed by placing the animals individually in actophotometer and the results were given in Table 2. The control animals showed 205.50±2.22 as activity score, where as the reference control diazepam showed 93.50±2.57, which significantly decreased (P<0.001) the locomotor activity. The ethanolic leaf extract of *Caryota urens* showed mild to moderate CNS depressant activity in dose dependent manner. The activity score of ethanolic leaf extract of *Caryota urens* at 200mg and 400mg was 170.83±3.55 and 155.67±2.60 respectively.

Table 3. Effect of Ethanolic Leaf Extract of *Caryota urens* on Elevated Plus Maze using mice

Groups	Drug Treatment	Number of Entries		Time Spent	
		Open Arm	Closed Arm	Open Arm	Closed Arm
I	Control 0.1% CMC (10ml/kg, p.o)	2.83±0.40	8.17±0.48	93.33±3.64	179.50±1.06
II	Diazepam (4mg/kg, i.p)	9.67±0.67***	4.00±0.77**	202.50±4.66***	68.83±1.56***
III	ELECU (200mg/kg, p.o)	7.33±0.49***	5.17±0.83*	158.33±4.66**	120.50±5.21*
IV	ELECU (400mg/kg, p.o)	8.50±0.62***	4.50±0.43**	190.33±6.26***	85.33±2.42***

Values are in mean ± SEM (n=6),
*P<0.05 , **P<0.01, ***P<0.001 Vs Control

The effect of ethanolic leaf extract of *Caryota urens* was studied on Elevated plus maze and the results were given in table 3. In Control group animals, number of entries in open and closed arm was 2.83±0.40 and 8.17±0.48 seconds respectively and time spent in open arm and closed arm was 93.33±3.64 and 179.50±1.06 seconds. The animals treated with diazepam, it significantly increase (P<0.001) the number of entries in open and reduces (P<0.01) the number of entries in closed arm compared to control. It also significantly increases (P<0.001) the time spent in open arm and reduces (P<0.001) the time spent in closed arm compared to control. The animals treated with ethanolic leaf extract of *Caryota urens* at 200mg/kg, showed significantly increase (P<0.001) the number of entries in open and reduces (P<0.05) the number of entries in closed arm compared to control. It also significantly increases (P<0.01) the time spent in open arm and reduces (P<0.05) the time spent in closed arm compared to control. The higher dose of ethanolic leaf extract of *Caryota urens*, 400mg/kg produced, significantly increase (P<0.001) the number of entries in open and reduces (P<0.01) the number of entries in closed arm compared to control. It also significantly increases (P<0.001) the time spent in open arm and reduces (P<0.001) the time spent in closed arm compared to control. Higher dose of ethanolic leaf extract of *Caryota urens* similar activity as that of the reference control, diazepam.

Table 5. Effect of Ethanolic Leaf Extract of *Caryota urens* on Muscle Grip Strength in mice using Rotarod.

Groups	Drug Treatment	Time taken to fall from rotating rod (secs)
I	Control 0.1% CMC (10ml/kg, p.o)	141.00±3.98
II	Diazepam (4mg/kg, i.p)	24.17±1.35***
III	ELECU (200mg/kg, p.o)	55.83±2.63***
IV	ELECU (400mg/kg, p.o)	36.00±2.65***

Values are in mean ± SEM (n=6),
*P<0.05 , **P<0.01, ***P<0.001 Vs Control

Skeletal Muscle Relaxant activity of ethanolic leaf extract of *Caryota urens* was studied in mice using Rota Rod and the results were shown in table 5. In muscle relaxation study, ethanolic leaf extract of *Caryota urens* at both the doses (200mg and 400mg/kg) showed highly significant (P<0.001) reduction in time spent by the animals on the revolving rod when compared to the control. The time taken to fall from the rotating rod after administration of 200mg and 400mg/kg of ethanolic leaf extract of *Caryota urens* was 55.83±2.63 and 36.00±2.65 seconds respectively. The standard drug (diazepam) also showed a highly significant effect when compared to the control ($P <$ 0.001) and time spend by the mice was 24.17±1.35 seconds. The result from the Rotarod test showed that the extract significantly reduced the motor coordination of the tested animals.

CONCLUSION

Several factors underlie the growing popularity of herbal treatments for a variety of chronic conditions. Interestingly, people who utilize alternative therapies are not necessarily uninformed. Many people using herbal medicines find the health care alternatives are more congruent with their own values, beliefs and philosophical orientations toward health and life. It is concluded that the ethanolic leaf extract of *Caryota urens* possess significant CNS effect on various animal models. However, further studies are necessary to examine the underlying mechanisms of CNS effects and to isolate the active compounds responsible for its activity.

REFERENCES

1 Yuhas, D. (2013). Throughout History, Defining Schizophrenia Has Remained a Challenge (Timeline). Scientific American Mind. 24 (1), 3 – 4.
2 Carlini, E.A,. (2003). Plants and the central nervous system. Pharmacology, Biochemistry and Behavior. 75, 501-512.
3 Ranasinghe, P., Premakumara, G.A.S., Wijayarathna, C.D., Ratnasooriya, W.D,. (2012). Antioxidant Activity of Caryota urens L. (Kithul) Sap. Tropical Agricultural Research. 23 (2), 117– 125.
4 Ambika, V., Arivudainambi, R., Sukumar, D,. (2012). Investigation on Caryota urens. International journal of Scientific Research. 1(4), 5-7.
5 Xiao, X., Zeng, X., Zhang, X., Ma, L., Liu, X., Yu, H. (2013). Effects of Caryota mitis profilin-loaded PLGA nanoparticles in a murine model of allergic asthma. International Journal of Nanomedicine. (8), 4553-4562.
6 Haja Sherief, S., Niraimathi, V., Sengottuvelu, S,. (2014). Evaluation of Abelmoschus moschatus seed extract I n psychiatric and neurological disorders. International Journal of Basic and Clinical Pharmacology. (3), 845-853.
7 Herrera-Ruiz, M., Gutierrez, C, Jimenez-Ferrer, J.E., Tortoriello, J., Miron, G., Leon, I,. (2007). Central nervous system depressant activity of an ethyl acetate extract from Ipomoea stans roots. Journal of Ethnopharmacology, 112, 243-247.
8 Kulkarni, S.K. (2009). Hand Book of Experimental Pharmacology, Vallabh Prakasan, Delhi, 3rd ed, 122-123.

Book:
Last, F. M. (Date Published). Book title. City, State: Publisher.
Journal:
Last, F. M. (Date Published). Article title. Journal Title, Volume(Issue), Page(s).