Research Article

Evaluation of Central Nervous System Depressent Activity of *Tinospora cordifolia* in Rats

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ABSTRACT

In present study, significant reduction in locomotor activity was observed in petroleum ether extract and ethanol extract of leaf, stem and root of *T. cordifolia* . when compared to control and rest of the extracts of *T. cordifolia* (except petroleum ether extract of leaf) also showed significant reduction in spontaneous locomotor activity. When compared to the reference standard Chlorpromazine. Chlorpromazine is a selective depressant of central nervous system (CNS) and used as a reference standard drug during the experiments. It also reduced the spontaneous motor activity significantly. Pentobarbitone sodium is a short acting hypnotic drug. Any drug, which depresses CNS, acts synergistically with the pentobarbitone. This is indicated by the potentiation of pentobarbitone sleeping time. Among the different crude extracts, petroleum ether extract of leaf followed by aqueous extract of stem and root of *T. cordifolia* showed maximum increase in percentage of sleeping was observed and significant increase in the percentage of sleeping time in minutes was recorded (106.14%) in the animals treated with petroleum ether extract of leaf followed by aqueous extract of stem (87.60%) and root (80.45%).

Keywords: Petroleum ether extract, Locomotor activity, Chlorpromazine, Pentobarbitone sodium.

INTRODUCTION

Man has been using vegetal materials for medicinal purposes since hoary past. It may be difficult to determine how and where this aspect of man-plant relationship started, but it is undeniable that on the basis of empirical of generation, human societies developed certain systems of herbal medicines. The Indian herbal industry is estimated to have a turnover of Rs. 2,300 crores annually while the global turnover in herbal medicine is over US $ 12 billion. More than 90% of plant species used by the industry are, however collected from wild; about 70% of the collection involves unorganized harvest which is invariably destructive [1].

The past, present and future of medicinal plants were analysed both as potential antimicrobial crude drugs as well as a source for natural compounds that act as new anti-infection agents. In the past few decades, the search for new anti-infection agents has occupied many research groups in the field of ethno pharmacology. Despite the vast availability of medicinal plants, *Tinospora cordifolia* plant selected in our study and the case for the collection of material and its unique importance in this area. Plants have always been an exemplary source of drugs and many of the currently available drugs have been derived directly or indirectly from them.

Tinospora cordifolia belongs to the family Menispermaceae, used in several indigenous drug preparations for general health and other disease conditions, has been shown to possess antiallergic, antidiabetic, antihepatotoxic, antipyretic and anti-inflammatory properties. Large climbing shrubs; bark grayish-brown or creamy-white, grooved stems, corky, warty, leaves membranous, broadly, ovate, cordate at base. The plant is sometimes cultivated as an ornamental plant. Flowers are small yellow or greenish yellow in axillary and terminal racemes which appears when the plant is leafless. Plant contains quaternary alkaloid magnoflorine, tembestarine, dried stem and bark of these plants are medicinal. It is used as Tonic, Antiperoidic and Aphrodisiac. In Ayurveda *T. cordifolia* used as tonic vitalizer and as a remedy for

Diabetes mellitus and metabolic disorders[2].

The present study looking into scientific exploration of peroleum ether and ethanol extract of leaf, stem and root of *T. cordifolia* as central nervous system depressent activity and significant increase in sleeping time.

MATERIALS AND METHODS

Plant material and preparation of the extract

The stem leaves and roots of *T. cordifolia* were collected from Western Ghats of Karnataka in and around the Kuvempu University campus. The plant was authenticated by comparing with the herbarium voucher specimen deposited at Kuvempu University herbaria. The plant materials of both the species were shade dried, powdered mechanically (sieve No. 10/44), mechanically, 500g of powdered material was soaked in Ethanol (B.P. 79°C) and Petroleum ether (B.P. 60-80ºC) for 48 hrs in 16 batches. Simultaneously 1 kg of each of the powdered stem, leaf and roots of *T. cordifolia* were boiled in distilled water for 30 min, kept for 3 days with intermittent shaking and filtered to get the aqueous extract [3]. It was filtered by using Whatman no.1 filter paper. The solvent was distilled out completely from the filtrate under the reduction pressure in Rota vapour.

Animal collection

The experimental animals were procured from the College of Pharmacy, Dharwad. These animals were maintained at standard housing conditions (temperature 27°C ± 1ºC; relative humidity 60 ± 5%) and were fed with commercial diet (Hindustan Lever Ltd., Bangalore) and water *ad libitum*, during the experiment, the institutional animal ethical committee (SETCP/IAEC/2006-2007/462) approved the study.

CNS depressant activity

i. Effect on locomotor activity [4]

Albino mice of either sex weighing about 25-30 g were fasted for 18 hrs. These animals were divided into eleven groups of six each, weighed and numbered. 1 ml/kg of 1% gum tragacanth was administered orally to the animals of group I. Chlorpromazine was given to the animals of group II in the dose of 3 mg/kg by intraperitoneal injection. This group served as the reference standard. The petroleum ether, ethanol and aqueous extract of *T. cordifolia* leaf (Group III, IV and V) stem (Group VI, VII and VIII) and root (Group IX, X and XI) were administered orally to the respective groups.

Each animal was placed individually in the Actophotometer for 10 min. The locomotor activity scores were recorded at 0 hr and after every 30 min of drug administration up to 3hrs. The reduction in the locomotor activity indicates CNS depressant property of the drug. Percentage decrease in the locomotor activity was calculated and recorded.

ii. Potentiation of Pentobarbitone sleeping time

In this method the animals of group I were treated with the drug pentobarbitone sodium. The administration of the crude extracts to the corresponding group of animals was similar to that of the previous experiment.

The test drugs were administered to the respective groups of animals in the doses similar to the earlier experiment. In addition, pentobarbitone sodium was administered intraperitoneally to all the animals in the dose of 35 mg/kg, after 45 min. the sleeping time was noted. The failure of the animal to stand on its limbs (loss of righting reflux) indicates that the animal has gone a sleep. The time at which the animal stands on its limbs (regain of righting reflux) indicates that the animal is awake. The percentage increase in sleeping time was calculated.

RESULTS

CNS depressant activity

i. Effect on locomotor activity

Most of the drugs acting on central nervous system influence locomotor activity in man and animals. The CNS depressant drugs such as barbiturates, alcohol and transquillizers like chlorpromazine reduce the locomotor activity while, the CNS stimulants such as caffeine and amphetamines increase the

activity. In other words, the locomotor activity can be an index of wakefulness (alertness) of mental activity. The locomotor activity can be studied using Actophotometer, which operates on photoelectric cells, connected in circuit with a counter.

Among the different solvent extracts evaluated during our study, petroleum ether, ethanol extracts of *T. cordifolia* leaf, stem and root showed significant reduction in locomotor activity after 2 hours of oral administration. Whereas the aqueous extract of leaf and root also showed significant reduction in locomotor activity after 2 hours. However, the animal group administered with aqueous extract of *T. cordifolia* stem the percentage decrease of locomotor activity was negligible and the results are summarized in table 1.

ii. Potentiation of pentobarbitone sleeping time

In the present study, significant increase in the percentage of sleeping time in minutes was recorded (106.14%) in the animals treated with petroleum ether extract of leaf followed by aqueous extract of stem (87.60%) and root (80.45%) of *T. cordifolia* Table 2.

DISCUSSION

Physiologically, sleep is regarded as absence of wake fulness. It is believed that restoration of natural balance among the neuronal centers in the brain take place chiefly during sleep and the association between sleep and growth in the early years of life is generally accepted. Insomnia may also be caused by drugs such as, ephedrine, chloroquine, metronidazole, diuretics, systemic glucocorticoids etc., The commonest cause of insomnia in the elderly is age-related changes in the sleep cycles, anxiety and loss of family support. In such cases only some extent of improvement can be achieved rather than total relief of insomnia. The commonly used hypnotics are barbiturates and benzodiazepines. The barbiturates facilitate inhibitory neuro-transmission in CNS, presumably by interacting with the alpha subunits of the GABA-A receptors to open chloride ion channels and hyperpolarize neuronal membrane. They also inhibit calcium current in the neurons. They depress the polysynaptic responses and delay synaptic recovery.

Most of the drug activities on CNS influence the locomotor activity in man and animals. The CNS depressant drugs such as barbiturates and alcohol reduce the locomotor activity while the CNS stimulants such as caffeine and amphetamines increase the activity. In other words, the locomotor activity can be an index of wakefulness (alertness) of mental activity. The locomotor activity can be easily measured using an Actophotometer, which operates on photoelectric cells, which are connected in circuit with a counter. When the animal cuts off a beam of light falling on the photocell, a count is recorded. An Actophotometer could have either circular or square area in which the animal moves.

In present investigation, significant reduction in locomotor activity was observed in petroleum ether extract and ethanol extract of leaf, stem and root of *T. cordifolia* when compared to control and rest of the extracts of *T. cordifolia* (except petroleum ether extract of leaf) also showed significant reduction in spontaneous motor activity. When compared to the reference standard Chlorpromazine. Chlorpromazine is a selective depressant of CNS and used as a reference standard drug during the experiments. It also reduced the spontaneous motor activity significantly. The effect of the crude drug extracts of the medicinal plants on spontaneous motor activity has been studied on *Cistanche deserticola* [5]; *Dalbergia malabarica* [6]; *Ficus platyphylla* [7]. Pentobarbitone sodium is a short acting hypnotic drug. Any drug, which depresses CNS, acts synergistically with the pentobarbitone. This is indicated by the potentiation of pentobarbitone sleeping time. The loss of righting reflex indicates the onset of action. While, the duration between the loss of righting reflex and the regain of righting reflex indicates the sleeping time. Among the different crude extracts, petroleum ether extract of leaf followed by aqueous extract of stem and root of *T. cordifolia* showed maximum

increase in percentage of sleeping was observed.

CONCLUSION

In the present study scientific evaluation was carried out by using petroleum ether and ethanol extract of leaf, stem and root of *T. cordifolia* to prove central nervous system depressent potential and maximum increase in percentage of sleeping was observed. The results were found to be significant for most of the extract of this plant hence, further investigation using more experimental paradigms are warranted for further confirmation of the treatment of various ailments, diseases and disorders.

Table 1: Effect of leaf, stem and root extracts of *T. cordifolia* on percentage decrease in locomotor activity in mice

Group (N)	0.0h[1]	0.5h[1]	1.0h[1]	1.5h[1]	2.0h[1]	2.5h[1]	3.0h[1]
				± SE[2]			
Control	0.0000	0.19±0.008	0.210±0.005	0.170±0.005	1.00±0.003	1.80±0.005	2.57±0.035
Chlorpromazine	0.0000	39.67±0.33	55.66±0.005	56.96±0.005	50.01±0.577	40.00±0.577	33.50±5.950
Pet. ether ext. of leaf of *T.C*	0.0000	26.10±0.005	30.10±0.005	38.60±0.005	48.10±0.005	42.40±0.005	39.50±0.057
Ethanol ext. of leaf of *T.C*	0.0000	21.17±0.005	26.80±0.005	30.86±0.005	39.10±0.005	36.80±0.005	30.66±0.008
Aqueous ext. of leaf of *T.C*	0.0000	18.10±0.005	20.80±0.005	26.80±0.005	32.10±0.005	30.12±0.005	24.10±0.005
Pet. ether ext. of stem of *T.C*	0.0000	20.19±0.005	37.15±0.005	46.98±0.005	48.31±0.005	25.79±0.005	6.91±0.008
Ethanol ext. of stem of *T.C*	0.0000	11.83±0.005	18.10±0.005	27.62±0.005	36.37±0.005	33.18±0.005	24.10±0.005
Aqueous ext. of stem of *T.C*	0.0000	2.02±0.005	3.46±0.008	7.62±0.005	5.92±0.005	4.81±0.005	3.94±0.065
Pet. ether ext. of root of *T.C*	0.0000	33.15±0.005	36.97±0.005	42.10±0.005	50.10±0.005	42.10±0.005	30.05±0.005
Ethanol ext. of root of *T.C*	0.0000	28.12±0.003	30.80±0.005	36.10±0.005	43.17±0.005	34.79±0.008	29.15±0.005
Aqueous ext. of root of *T.C*	0.0000	39.14±0.008	42.42±0.005	44.66±0.005	45.95±0.005	40.17±0.005	32.15±0.005
F (P 0.0001)	0.0000	17750.994	7149.755	8463.928	9878.203	6691.718	51.352

1 − Data is an average of three replicates; 2 − Standard Error; *T. C* − *Tinospora cordifolia*

Table 2: Effect of leaf, stem and root extracts of *T. cordifolia* on potentiation of Pentobarbitone sleeping time in mice

Group (N)	Duration of sleep in minutes[1]	Percentage increase of sleep in minutes[1]
	± SE[2]	
Control + pentobarbitone	22.59±0.005	0.0000
Pet. ether ext. of leaf of *T.C* + pentobarbitone	46.59±0.005	106.14±0.026
Ethanol ext. of leaf of *T.C* + pentobarbitone	36.65±0.165	62.90±0.038
Aqueous ext. of leaf of *T.C* + pentobarbitone	23.16±0.012	2.490±0.056
Pet. ether ext. of stem of *T.C* + pentobarbitone	38.21±0.008	69.08±0.037
Ethanol ext. of stem of *T.C* + pentobarbitone	22.68±0.008	0.4033±0.018
Aqueous ext. of stem of *T.C* + pentobarbitone	42.40±0.265	87.60±1.173
Pet. ether ext. of root of *T.C* + pentobarbitone	23.78±0.011	5.21±0.049
Ethanol ext. of root of *T.C* + pentobarbitone	28.66±0.035	26.81±0.155
Aqueous ext. of root of *T.C* + pentobarbitone	40.78±0.012	80.45±0.053
F (P 0.0001)	8801.348	12135.238

1 − Data is an average of three replicates; 2 − Standard Error; *T. C* − *Tinospora cordifolia*

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