Antidepressant and Skeletal Muscle Relaxant Activity of Methanolic Extracts of *Basella alba. L*

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Research Article

Article Info:
Received on: 30/03/2016
Published on: 30/04/2016

QR Code for mobile

Literati Open Access

ABSTRACT :
Depression is considered as affective mood disorder which is characterized by change in mood, lack of confidence, etc. Depression is the most prevelant disorder and the symptoms associated with depression changes the neurotransmitter levels in brain such as norepinephrine, serotonin and dopamine. Muscle relaxant is a term usually used to refer to skeletal muscle relaxants (drugs), which act on the central nervous system (CNS) to relax muscles. These drugs are often prescribed to reduce pain and soreness associated with sprains, strains, or other types of muscle injury. *Basella alba* is the plant selected to use as a test drug in experimental animals. After selecting the plant, Leaves has been dried and powdered by using methanol and extracted by using soxhlet apparatus. Evaluation of anti depressant activity as well as skeletal muscle relaxant activity has been done to test the potency of the drug and to know its activity. After comparing the test drug with standard drug Diazepam results has shown that the extract has both anti depressant and skeletal muscle relaxant activities .Therefore, it is concluded that *Basella alba* extract has good anti depressant and skeletal muscle relaxant activity on mice.
Keywords: *Basella alba,* anti depressant activity, skeletal muscle relaxant activity, Diazepam.

INTRODUCTION:

According to the World Health Organization report[1] approximately 450 million people suffer from a mental or behavioral disorder. This amounts to 12.3% of the global burden of disease, and will rise to 15% by 2020 [2]. Psychiatric illness is also often associated with suicide and there are between 10 and 20 million suicide attempts every year. Depression is the most prevalent mental disorder and depression is recognized to be symptomatically, psychologically and biologically heterogeneous [3]. The disorder was characterized by apathy, loss of energy, retardation of thinking and activity, as well as profound feelings of gloominess, despair and suicidal ideation. In spite of the availability of antidepressant drugs like tricyclic antidepressants, selective reversible inhibitors of monoamine oxidase-A (MAO-A), selective serotonin reuptake inhibitors (SSRIs) and selective noradrenaline reuptake inhibitors (SNRIs), depression continue to be a major medical problem. Basic neuroscience offers the promise of improving our understanding of disease pathophysiology, identifying novel mechanisms that can be targeted by more effective pharmacotherapies and screening of herbal sources of drugs. These considerations implicate the search for new antidepressant agents that have a fast onset of action. Various plants are being used in complementary and alternative medicines for management of mood disorders. On the basis of the above information, the leaves of *Basella alba* was selected for evaluating its antidepressant and muscle relaxant activity due to its traditional use in the management of various CNS disorders.

Basella alba L. (Synonym: Basella rubra Roxb.) is an extremely heat tolerant [4], fast growing perennial vine which belongs to family Basellaceae [5]. It is commonly known as Malabar spinach, Indian spinach, Ceylon spinach, vine spinach [6], climbing spinach [7], East-Indian spinach, Chinese spinach [8] and cyclone spinach [9]. Basella is native to tropical Southern Asia, probably originated from India or Indonesia [10]. Due to easy adaptation to a variety of soils and climates *Basella alba* is considered one of the best tropical spinach throughout the tropical world [11]. *Basella alba* is one of the wild leafy vegetables, which is rare in its natural habitat [12] but. Nowadays it is an important leafy vegetable grown for its nutritive value [13] throughout the temperate regions as an annual and the tropics as a perennial [14]. Almost in every part of India, *Basella* is grown as a pot herb [15].

Numerous bioactive compounds such as flavonoids, Saponins, Phenolic and tannins have been isolated from leaves of *Basella alba*. Some of these bioactive compounds have been worked out for one or the other medicinal attributes [16]. But till date, the antidepressant and muscle relaxant potential of *Basella alba* has not been scientifically evaluated. Hence, in the present study, the effect with *Basella alba* leaves extract at a dose of 25 and 50 mg/kg body wt on antidepressant and skeletal muscle relaxant activity has been

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Conflict of interest: Authors reported none

studied.

Materials and Methods

Drugs and Chemicals

Drugs and Chemicals used in this study were of analytical grade and of highest purity procured from standard commercial sources in India.

Experimental animals

Healthy adult albino mice weighing 40-50 grams of either sex were selected for the study. Animals were housed in appropriate cages in uniform hygienic conditions and fed with standard pellet diet (Amrul Laboratory Animal Diet) and water ad libitum. They were fasted overnight before the day of experiment. Animals were housed within the departmental animal house and the room temperature was maintained at 27°C. Animal studies had approval of IAEC.

Plant Material Collection

The leaves of *Basella alba* were collected from local market in the month of January. The plant material was cleaned, reduced to small fragments, air dried under shade at room temperature and coarsely powdered in a mixer. The powdered material was stored or taken up for extraction process.

Preparation of plant extracts

The powdered Leaves of *Basella alba* were successively extracted in 100-150ml each of methanol by using Soxhlet extractor. The plant material was suspended in the main chamber of Soxhlet extractor which was then placed onto a flask containing the extraction solvent. The Soxhlet was then equipped with a condenser. The flask was heated; the solvent evaporated and moved up into the condenser where it was converted into a liquid that trickled into the extraction chamber containing the sample. This extraction process kept for 8hrs at 20-40^{0}C. At the end of the hot extraction process each extract was filtered. The filtered extract was dried in oven to remove remaining moisture, if present, and finally weighed and sealed up for further use.

Phytochemical screening

The methanolic extract of *Basella alba* was screened for various chemical constituents (tannins, alkaloids, cardiac glycosides, flavonoids, steroidal compounds, saponins) using established methods [16].

Anti-Depressant Activity:

Despair Swim Test [17]

For the determination of antidepressant activity, forced swim test (FST) protocol was employed. During the test, animals were individually placed in a glass cylinder (20 cm in height, 14 cm in diameter) filled with water up to a height of 10cm, at 25 ± 2°C. All animals were forced to swim for 5 min and the duration of immobility was observed and measured during the 5 min interval of the test. Immobility period was regarded as the time spent by the rats to float in water with no struggle and making only those movements necessary to keep its head above the water. In order to check the fitness level of each test animal, a pre-test was carried out 24 h before the FST by subjecting each test animal to a session of 15 min swimming.

Tail suspension test[18]

Tail suspension test was performed based on the method prescribed[18]. The mice were suspended 58cm above the floor by means of an adhesive tape, placed approximately 1cm from the tip of the tail. The total duration of immobility was quantified during a test period of 5min. Mice were considered immobile when they were completely remain motionless.

Skeletal muscle relaxant Activity:

Rota rod test[19]

The test procedure was carried out according to the method described by S.K.Kulkarni and validated in the laboratory. In brief, four groups of mice are taken and named as Test1 and Test2, control and Standard. Each group contains six animals. Before injecting a drug, mice were individually kept on rota rod at a speed of 25-26 rpm. Animals remain on Rota-Rod (25 rpm) 5 min or more after low successive trials are included in the study. After the administration of test material or control vehicle the same test of 30 min for 2 hr. The fall off time from the rotating rod was noted. The difference in the fall off time from the rotating rod between the control and treated rats was taken as an index of muscle relaxation.

Muscle grip strength test[20]

This test is used to assess muscular strength in rodents which can be influenced by muscle relaxants and sedative drugs. In a preliminary experiment the animals are tested for their normal grip strength by exposing them to horizontal thin metallic wire suspended about 30cm in the air, which they immediately grasp with their forceps. The mouse is then released to hang on with its forelimbs. Normal animals are able to catch the wire with the hind limbs and climb on it with 5seconds. Only animals which fulfil this criterion are included in the test. Then now test groups should tested for every 15min for 2 hours. The percentage of animals loosing the grip strength is recorded using different test and standard drugs.

Results:

The preliminary phytochemical screening of the dry residue showed the presence of saponins, flavonoids, glycosides, tannins and phenolic compounds.

The effects of extract on duration of immobility in FST and TST in mice have been shown in Table I and II; *Basella alba* at dose 25 and 50mg/kg b.wt produced a significant ($p<0.05$) decrease in duration of immobility in FST(47.82% and 45.23%) and TST(38.59% and 48.43%) in comparision with the control group. Similarly animals treated with standard (5mg/kg) shows a significant decrease in immobility time (84.48% and 81.81%).

Table No:I Data obtained from Forced Swim Test

S.No	Treatment	Dose (mg/kg)	Drug Administration (sec)		% change in activity
			Before	After 60 min	
1.	Control	--	52	50	3.84%
2.	Diazepam	5	58	9	84.48%
3.	MEBA-1	25	46	24	47.82%
4.	MEBA-2	50	42	23	45.23%

Table:II- Data obtained from Tail Suspension Test

S.No	Treatment	Dose(mg/kg)	Drug Administration (sec)		% change in activity
			Before	After 60 min	
1.	Control	--	46	63	-36.93%
2.	Diazepam	5	66	12	81.81%
3.	MEBA-1	25	57	35	38.59%
4.	MEBA-2	50	64	33	48.43%

The results are expressed as means ± S.E.M Differences in mean values between groups were analyzed by a one-way analysis of variance (ANOVA). Statistical significance was assessed as $p < 0.05$.

The effect of muscle relaxant action have been shown in Table III and IV at a dose of 25 and 50 mg/kg b.wt produced a significant (p<0.05) decrease in fall off time (40.00% and 55.03%) and decrease in grip strength(83.83% and 51.61%)after 60minutes of Intraperitoneal injection respectively. Similarly animals treated with Diazepam (5mg/kg) shows a significant decrease in fall off time and grip strength (80.28% and 81.63%).

Table: III - Data obtained from Rotarod Test

S.No	Treatment	Dose(mg/kg)	Drug Administration (sec)		% change in activity
			Before	After 60 min	
1.	Control	--	289	278	16.31%
2.	Diazepam	5	142	28	80.28%
3.	MEBA-1	25	300	180	40.00%
4.	MEBA-2	50	258	116	55.03%

Table: IV - Data obtained from Muscle Grip Strength Test

S.No	Treatment	Dose(mg/kg)	Drug Administration (sec)		% change in activity
			Before	After 60 min	
1.	Control	--	42	38	9.52%
2.	Diazepam	5	49	9	81.63%
3.	MEBA-1	25	99	16	83.83%
4.	MEBA-2	50	31	15	51.61%

The results are expressed as means ± S.E.M Differences in mean values between groups were analyzed by a one-way analysis of variance (ANOVA). Statistical significance was assessed as $p < 0.05$.

DISCUSSION AND CONCLUSION:

In the present work attempts were made to study detail phytochemical investigation and pharmacological action, particularly antidepressant and skeletal muscle relaxant activities. The phytochemical analysis of the methanolic extraxts showed the presence of saponins, flavonoids, tannins and phenolic compounds. The two most widely used animal models for antidepressant screening are the forced swimming and tail suspension tests. These tests are quite sensitive and relatively specific to all major classes of antidepressants (Porsolt, Bertin, Jalfre, 1977). In the FST, mice are forced to swim in restricted space from which they cannot escape. This induces a state of behavioral despair in animals, which is claimed to reproduce a condition similar to human depression (Willner; 1984). Whereas the TST Results showed that the administration of the MEBA-1 and 2 produced a decrease of immobility time of mice exposed to the forced swimming test. In the study, methanolic extracts (25 and 50 mg/kg) administered to mice, produced significant antidepressant-like effect in FST and TST its efficacy was found to be comparable to diazepam (5 mg/kg). For Skeletal muscle relaxant action rotarod test and muscle grip strength is used. The test is used to evaluate the activity of drugs interfering with motor coordination. In 1956, Dunham and Miya suggested that the skeletal muscle relaxation induced by a test compound could be evaluated by testing the ability of mice or rats to remain on a revolving rod. This forced motor activity has subsequently been used by many investigators. The dose which impairs the ability of 50% of the mice to remain on the revolving rod is considered the endpoint. By this test the muscle relaxant potency in a series of compounds such as the benzodiazepines (Vogel et al) has been performed. Results showed that the administration of the MEBA-1 and 2 produced a significant decrease in fall off time and its efficacy was found to be comparable with Diazepam (5mg/ kg). Based on the results of the present study, we conclude that the methanolic extract of *Basella.Alba* possess significant antidepressant like effect and skeletal muscle relaxant activity. The activity may be due to the alkaloids, tannins and flavonoid which are present in the leaves extract. However, further studies are necessary to find the exact mechanism of antidepresant and skeletal muscle relaxant effect and to isolate the active compound(s) responsible for this pharmacological activity.

ACKNOWLEDGEMENTS

The authors are very much thankful to Geethanjali College of pharmacy, Hyderabad for their support in carrying out the research work.

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Cite this article as:
G.Abhinayani*, G. Niketha Goud, K.Chinna Nagamani, Davinder Kaur. Antidepressant and Skeletal Muscle Relaxant Activity of Methanolic Extracts of *Basella alba. L.* Asian Journal of Biomedical and Pharmaceutical Sciences, 6(55), 2016, 07-10.