Original Article

PHARMACOLOGICAL EVALUATION OF ANTIANXIETY ACTIVITY OF *DESMOSTACHYA BIPINNATA* LEAVES IN ANIMAL MODELS

VEENA RANI I.*[1], KIRANMAI G.[1], RAVI PRATAP PULLA[2]

[1]Department of Pharmacology, SSJ College of Pharmacy, Vattinagulapally, Hyderabad-75, [2]Department of PA and QA, SSJ College of Pharmacy, Vattinagulapally, Hyderabad-75
Email: vina913@gmail.com

ABSTRACT

Objective: Anxiety is a widespread psychiatric disorder affecting around 5% of the population. Furthermore, it is difficult to predict patient's response to any given treatment. In the traditional systems of medicine, many plants have been used to treat anxiety and depression for thousands of years. *Desmostachyabipinnata* belongs to the family Poaceae, have pharmacological actions like dysentery and menorrhagia, and as a diuretic. The present study was designed to evaluate the antianxiety activity of the alcoholic and aqueous extracts of *Desmostachyabipinnata* leaves in rodents.

Methods: Antianxiety activity was screened by different methods like elevated plus maze model and actophotometer.

Results: The results infer that reduced aversion fear elicits anti-anxiety activity.

Conclusion: It was concluded that alcoholic and aqueous extracts of *Desmostachyabipinnata* leaves are having anti-anxiety activity among which alcoholic extract of *Desmostachyabipinnata* leaves showing more significant activity over the aqueous extract.

Keywords: *Desmostachyabipinnata*, Antianxiety activity, Elevated plus maze, Actophotometer

INTRODUCTION

According to the World Health Organization nearly 450 million people suffering from psychological or behavioural ailments, yet only a small minority of them receive even the most elementary treatment. This amounts to 12.3% of the global load of disease and will rise to 15% by 2020 [1]. In the search for new therapeutic products for the treatment of neurological disorders, medicinal plant research has progressed constantly representing the pharmacological effectiveness of diverse plant species in a variety of animal models [2]. It is now clear that without awareness of clinical and biological aspects of anxiety and depression, it is difficult to offer actual treatment approaches for the patients. There has been an intensive study of a variety of neurobiological aspects of depression and anxiety from the past decades.

Presently the most commonly approved medications for anxiety disorders are benzodiazepines but their clinical applications as antianxiety agents are limited due to their undesirable effects. Therefore the development of new pharmacological agents from plant sources are well justified.

Desmostachyabipinnata, commonly known in english as half a grass, big cordgrass, and salt reed-grass is an old world perennial grass, used in human history. In India, it is known as *Daabh*, *Darbha*, *Kusha*. From literature survey it was found that *Desmostachyabipinnta* processes antibacterial activity [3] anti-ulcerogenic [4], antioxidant and DNA damage protection activity [5], anti-histaminic activity [6], anti-obesity activity [7], glycemic Status in Non-diabetic Rats [8], diuretic and laxative activity [9], anti-diarrheal activity [10], anti urolithiatic activity [11], anti-helicobacter activity [12], use in gut disorders and asthma [13], analgesic and anti-inflammatory [14], hepatoprotective activity [15, 16]. The purpose of the present study was to evaluate the antianxiety activity of alcoholic and aqueous extracts of *Desmostachyabipinnata.* In spite of extensive literature available on some components of this plant, there is no known data regarding the pharmacological evaluation on anti-anxiety activity. Thus, this study was intended to performanti-anxiety in experimental animal models.

MATERIALS AND METHODS

Animals

Wistar rats (180±20g) of either sex were procured from institutional animal house and they were retained in the groups of six under the standard laboratory conditions (Temp 23±2 °C, relative humidity 50-60% and 12:12 h light–dark cycle), with standard pellet diet (Amrut brand) and water ad libitum. Experiments were performed only after the animals had acclimated to the laboratory conditions for at least seven days. The experimental protocol was approved by institutional animal ethics committee (1757/PO/RcBiBt/CPCSEA).

Plant material collection and extraction

The leaves of *Desmostachya Bipinnata* were collected cleaned, reduced to small fragments, air dried under shade at room temperature and coarsely powdered in a mixer. The powdered material was taken up for alcoholic extraction by taking 20 gms of powdered material into 250 ml beaker containing 200 ml of alcohol. The contents were mixed well and boiled up to 50-60 °C for 4-5 h. Further, the extract was filtered with whatmann filter paper. The filtrate was boiled until the concentrated residue is formed.

The aqueous extract was prepared by taking 20 gms of finely cut leaves into 250 ml beaker containing 200 ml of water and was boiled up to 80-100 °C for 4-5 h. Further, the extract was filtered with whatmann filter paper. The filtrate was boiled until the concentrated residue is formed. This residue was used for the experiment.

The aqueous and alcoholic extracts of *Desmostachyabipinnata* suspended in water in presence of 3%v/v Tween-80 solution. The drugs were administered orally for investigation a determination. Each time preparations of the extracts were prepared when required. The drugs were administered at a constant volume of 10 ml/kg for each animal. The aqueous and alcoholic extracts of Desmostachyabipinnata leaves were tested for anti-anxiety activity using elevated plus maze and act ophotometer.

Treatment schedule

Animals were divided into four (I-VI) groups.

Group I-Control group received distilled water (1 ml, p. o).

Group II-Standard group received Diazepam (10 mg/kg i. p).

Group III (AQEDB-1)-Test group received an aqueous extract of *Desmostachyabipinnata* (200 mg/kg p. o).

Group IV (AQEDB-2)-Test group received aqueous extract of *Desmostachyabipinnata* (400 mg/kg p. o).

Group V (ALEDB-1)-Test group received an alcoholic extract of *Desmostachyabipinnata* (200 mg/kg p. o).

Group VI (ALEDB-2)-Test group received an alcoholic extract of *Desmostachyabipinnata* (400 mg/kg p. o).

Anti-anxiety activity by elevated plus maze (EPM) model

The apparatus comprises of two open (35x5 cm) and two closed arms (30x5x15 cm) that extend from a common central platform (5x5 cm). The entire maze is elevated to a height of 50 cm above the ground level. Rats weighing (150–200 gms) were housed in a pair of 10 d prior to the test in the apparatus and were handled by the

investigator on alternate days to reduce stress. 30and 60 min following oral administration of the drugs, each rat was located in the centre of the maze which is facing enclosed arms. During 5 min session, a number of entries into open arm and time spent in it was noted. The procedure was conducted preferably in a sound attenuated environment.

Anti-anxiety activity by Locomotor activity

The locomotor activity can be easily studied with the help of actophotometer [17], after the drug treatments rats are placed individually in the activity cage for 10 min. Note the basal activity score of all the animals. After 30 min re-test each rat for activity scores for 10 min. Note the difference in the activity, before and after drug treatment. Calculate percent decrease in motor activity.

Statistical analysis

The values were expressed as mean±SEM and data were analyzed using one-way ANOVA followed by T-test. Two sets of comparison had made. i.e. Normal control Vs All treated groups. Differences between groups were considered significant at $P<0.001$ and $P<0.05$ levels.

Table 1: Data obtained from elevated plus maze experiment

Groups	Dose	No of entries		Time spent in time spent in	
		Open Arm	Closed Arm	Open Arm	Closed Arm
Control (Distilled Water)	------	2.36±1.25*	2.48.10±1.58*	30.12±8.05*	266.45±21.47*
Standard (Diazepam)	10 mg/kg	4.21±0.65	4.01±1.45	26.88±12.36	170.55±30.54
AQEDB-1	200 mg/kg	3.95±0.87**	3.10±1.44**	30.54±11.51**	150.20±22.36*
AQEDB-2	400 mg/kg	3.50±1.54*	3.14±0.24*	28.23±1.65*	165.41±19.32*
ALEDB-1	200 mg/kg	3.52±1.87**	2.98±1.72**	32.14±1.74**	162.22±24.65**
ALEDB-2	400 mg/kg	3.02±.44**	2.71±1.05**	25.21±0.89**	154.36±32.12**

Values expressed mean±SEM ***$p<0.001$, **$p<0.01$, *$p<0.05$ when compared to Standard group. One-way ANOVA followed by Dunnett's test

RESULTS

Elevated plus maze (EPM) model

From the experiment, it was observed that rats given aqueous and alcohol soluble fraction at a dose of 200 mg/kg and 400 mg/kg body weight, stayed more time in open arm of Elevated plus Maze apparatus in comparison to standard and control group. Moreover, they also stayed less time in closed arm of Elevated plus Maze apparatus in comparison to standard and control group. The value obtained from these fraction were statistically significant ($p<0.05$).

Actophotometer model

Anxiolytic property of aqueous and alcoholic extracts of *Desmostacyabipinnata* was studied at a dose of 200 and 400 mg/Kg, using Actophotometer model.

The percentage of reduction in locomotor activity with diazepam (10 mg/kg i. p) after 1 hour is 80 % i.e. there is significant ($P<0.001$) decrease in locomotor activity compare to control, where as dose of AQEDB and ALEDB (200 and 400 mg/kg i. p) showed dose dependent decrease in locomotor activity that is 78.3% and 75.8% respectively when compared to standard. The values are highly significant ($P<0.001$)

Table 2: Effect of extracts of *Desmostachyabipinnata* on Locomotor activity

S. No.	Groups	Dose(mg/kg)	Locomotor activity in 10 min		
			Before	After	% change in activity
1	Control	-	245.12±35.44	--	---
2	Standard	30	270.32±45.02	82.33±10.69	68.5
3	AQEDB-1	200	365.21±43.65**	79.06±9.26**	78.3
4	AQEDB-2	400	374.11±36.54***	70.65±8.55***	81.2
5	ALEDB-1	200	286.60±36.88**	69.05±9.88**	75.8
6	ALEDB-2	400	300.33±39.65***	60.65±6.54***	80

Values expressed mean±SEM ***$p<0.001$, **$p<0.01$, *$p<0.05$ when compared to standard group. One-way ANOVA followed by Dunnett's test, The results are expressed as means±SEM 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

The anti-anxiety activity of *Desmostachyabipinnata* was evaluated by using a widely used model like elevated plus-maze. Mean a number of entries and time spent by rats in open arms amongst aqueous and alcoholic extracts of *Desmostachyabipinnata* significantly increased mean number of entries and mean time spent by rats in open arms of elevated plus maze apparatus at the dose of 200 mg/kg with respect to control, thereby showing anti-anxiety activity. *Desmostachyabipinnata*

contains different chemical constituents like alkaloids, Carbohydrates, Saponins, Tannins, Phytosterols and Phenolic compounds, lignin, flavonoids, protein and free amino acids [18].

It was earlier reported that several essential oils that are obtained from florae are engaged to balance emotions, develop physical and mental well-being [19] by different mechanisms. Therefore, essential oils that are present in the extracts of *Desmostachya bipinnata* [20] may be responsible for the anti-anxiety activity.

Further, the anxiolytic effect of flavonoids has been attributed to its effect on the central nervous system and benzodiazepine receptors [21]. It may be possible that the mechanism of anxiolytic action of AQEDB and ALEDB could be due to the binding of any of these phytochemicals to the GABAA-BZD complex. So the anxiolytic activity of AQEDB and ALEDB might involve an action on GABA ergic transmission or effects on serotonergic transmission or due to its mixed aminergic potentiating effect.

Spontaneous locomotor activity is considered as an index of alertness and can be helpful to confirm the general depressive activity of any drug. The reduction in motor activity indicates the level of CNS excitability and this may be related to sedation due to CNS depression. However, in the present study, the AQEDB and ALEDB was found to have decreased effect on the locomomotor activity in actophotometer.

CONCLUSION

The results obtained in this study indicate that the alcoholic and aqueous extracts fractions of the leaves of *Desmostacyabipinnata* have significant CNS Depressant and Anxiolytic activities in animal model systems. The medicinal values of the plant leaves may be related to their constituent phytochemicals. So, further detailed investigations are needed to isolate and identify the active compounds present in the plant extract and its various fractions. It will help in the development of novel and safe drugs for the treatment of different types of CNS disorders.

CONFLICT OF INTERESTS

Declare none

REFERENCES

1. Reynolds EH. Brain and mind: a challenge for WHO. Lancet 2003;361:1924–25.
2. Patel, Nitirajshree, Praboth V Shah. Evaluation of antidepressant activity of herbomineral formulation. Int J Pharm Pharm Sci 2016;8:1-6.
3. Hina H, Audil R. Isolation of fungi from roots of partheniumhysterophorus and *Desmostachyabipinnata* and antibacterial activity of their root extracts. J Biol Sci 2001;5:350.
4. Amani SA, Nawal HM, Derek JM, Gamal AS. Antiulcerogenic activity of extract and some isolated flavonoids from *Desmostachiabipinnata* (L.) Stapf. Rec Nat Prod 2008;2:76-82.
5. Upendarrao Golla, Solomon Sunder Raj Bhimathati. Evaluation of antioxidant and DNA damage protection activity of the hydroalcoholic extract of *Desmostachyabipinnata* L. Stapf. Sci World J 2014. http://dx.doi.org/10.1155/2014/215084
6. Anupama Singh, Vikas Anand Saharan, Indrachand Kumawat, Ram Veerma, Anil Bhandari. Anti-histaminic Activity of *Desmostachya bipinnata*. J Biol Act Prod Nat 2014;4:7-11.
7. Yaso Deepika, M Aparna Rama, Lakshmi Devi, B Nagaraju, P Ramya Deepthi, B Vasudha Bakshi. Anti obesity activity and beneficial effects of methanolic extract of desmostachyabipinnata in HFD and progesterone induced obesity in rats and mice. Int J Pharm Sci Res 2016;7:4644-55.
8. Upendrarao Golla, Praveen Kumar Gajam, Solomon Sunder Raj B. The effect of Desmostachyabipinnata (Linn.) extract on physiologically altered glycemic status in nondiabetic rats. J Med Sci 2013;13:221-5.
9. Golla U, Gajam PK, Bhimathati SS. Evaluation of diuretic and laxative activity of hydroalcoholic extract of Desmostachyabipinnata (L.) Stapf in rats. J Integrative Med 2014;12:372-8.
10. Medha M Hegde, K Lakshman, K Girija, BS Ashok kumar, V Lakshmiprasanna. Assessment of antidiarrhoeal activity of Desmostachyabipinnata L. (Poaceae) root extracts. Food Agric Organization United Nations 2010;9:312-8.
12. R Naga Kishore, T Mangilal, N Anjaneyulu, G Abhinayani, N sravya. Investigation of anti-urolithiatic activity of brassica oleraceagongylodes and *desmostachyabipinnata* in experimentally induced urolithiasis in animal models. Int J Pharm Pharm Sci 2014;6:602-4.
13. Mohammed A Ramadan, NA Safwat. Antihelicobacter activity of a flavonoid compound isolated from *Desmostachya Bipinnata*. Australian J Basic Appl Sci 2009;3:2270-7.
14. Hafiz Muhammad Abdur Rahman, Samra Bashir, Anwarul Hassan Gilani. Calcium channel blocking activity in *Desmostachyabipinnata* (L.) explains its use in gut and airways disorders. Phytother Res 2013;27:678-84.
15. Vinod Kumar, Rajeev Kumar, Sanjay Yadav, Satyawan Singh, Surendra Nath Pandeya. Evaluation of analgesic and anti-inflammatory activity of hydroalcoholic extract of *Desmostachyabipinnata* (L.) stapf root on experimental animals. Int J Pharm Sci Drug Res 2010;2:213-5.
16. Kalpana Pravin Rahate, A Rajasekaran. Hepatoprotection by active fractions from *Desmostachya bipinnata* stapf (L.) against tamoxifen-induced hepatotoxicity. Indian J Pharmacol 2015;47:311-5.
17. D Benito Johnson, Neethu P Charles, Banshongdor H Mawlieh, Timai Passah, V Venkatanarayanan. Evaluation of the anti-oxidant and hepatoprotective activity of Desmostachyabipinnata leaf extracts by various hepatotoxin induced albino rat models. Res J Pharmacogn Phytochem 2016;8:109-15.
18. Rodgers RJ, Cao BJ, Dalvi A, Holmes A. Animal models of anxiety: an ethological perspective. Brazilian J Med Biol Res 1997;30:289–304.
19. N Packialakshmi, Alwin. Analysis of phytochemical and high-performance liquid chromatography in *Desmostachyabipinnata*. BMR Biotechnol 2014;1:1-6.
20. Gnatta JR, Dornellas EV, Paes da Silva MJ. The use of aromatherapy in alleviating anxiety. Acta Paul Enferm 2011;24:257-63.
21. K Ashok Kumar, Sharvanee, Jitendra Patel, Ram Kumar Choudhary. Chemical composition and antimicrobial activity of the essential oil of *Desmostachyabipinnata*linn. Int J Phytomed 2010;2:436-9.
22. Jane R Hanrahan, Mary Chebib, Graham AR Johnston. Flavonoid modulation of GABAA receptors. Br J Pharmacol 2011;163:234–45.

How to cite this article