Research Article

Evaluation of *Helicteres isora* roots extract for Antidepressant effect

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Abstract

Objective: The present study was aimed to investigate the pharmacological potential of *Helicteres isora* on the central nervous system, as well as antioxidant activity. Phytochemical study was performed for detection of various chemical constituents in the *Helicteres isora* roots. The behavioral despair model was performed in order to investigate the ability of *Helicteres isora* roots in the elevation of suppressed mood, which is quite common in today's scenario. **Results:** The phytochemical investigation of plant extracts were showed that it contains variety of phytochemicals specially we found that the ethanolic extract of *Helicteres isora* roots contain phenolics, flavonoids, glycosides and tannins. The present findings suggested that ethanolic extract when administered at an acute dose of 100 and 200 mg/kg of body weight ($P<0.05$) reduced the immobility time by 160 and 125 sec, respectively, as compared to the immobility time of control i.e. 180 sec. These results were shown that after standard i.e. Imipramine HCl (100 mg/ml) and the ethanol extract is most potent in dose dependent manner. Findings on tail suspension test were quite comparable to the previous FS test. In both these studies, ethanol extract significantly reduced the immobility time 160 and 125 sec. at a dose of 200 mg/kg and 100 mg/kg respectively, which was comparable to the standard group. Major ingredients reported in the ethanol extract are polyphenols, especially flavonoids including quercetin. In conclusion, *Helicteres isora* roots are showed potent antidepressant effect through possible antioxidant mechanism. This effect may be due to presence of flavonoid components present in ethanol extract of *Helicteres isora* roots.

Keywords: *Helicteres isora,* antidepressant, quercetin, polyphenols, antioxidant

Introduction

The major disorders of mood or affect include the syndromes of major depression (formerly termed melancholia) and bipolar disorder (formerly termed manic-depressive disorder). The lifetime prevalence of bipolar disorder is 1% to 2% for type I (with mania). It is about twice that rate if cases of recurrent depression with milder upswings of mood (hypomania) are included (type II bipolar disorder). Lifetime risk for major depression is considerably higher, at 5% to 10%, and approximately twice the risk in women than in men (Tondo *et al*., 2003). These disorders commonly include disordered autonomic functioning (e.g., altered rhythms of activity, sleep, and appetite) and behavior, as well as persistent abnormalities of mood. These disorders are associated with increased risk of self-harm or suicide as well as increased mortality from stress-sensitive general medical conditions, medical complications of comorbid abuse of alcohol or illicit drugs, or from accidents (Kessler, 1994).

Avartani (*Helicteres isora* Linn.) is a medicinal plant which is used in several diseases. It is commonly known as Marodphali, Marorphali, Enthani etc. due to screw like appearance of its fruit. Avartani is used as a folk medicine to treat snake bite, diarrhoea and constipation of new born baby. In the research, antioxidant, hypolipidaemic, antibacterial and antiplasmid activities, cardiac antioxidant, antiperoxidative potency, brain-antioxidation potency, anticancer activity, antinociceptive activity, hepatoprotective activity, anti-diarrheal activity and wormicidal activity in this plant were reviewed (Kirtikar and Basu, 1987).

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A preliminary study of phytoconstituents of seeds by Nair and Grampurohit showed the presence of phytosterols, fixed oils and fats, phenolic compounds and tannins and amino acid and carbohydrates (Nair and Grampurohit, 1996). Cucurbitacin B and isocucurbitacin B have been isolated from its root (Chatterjee and Pakrashi, 1995; Chopda et al., 1958). Most of the remedies were taken from plants and proved to be useful in the indigenous system of medicine. However, the literature review revealed that *Helicteres isora* roots has been used traditionally for cuts, injuries and inflammatory disorders but not reported any systematic study by any researcher. Therefore, the present studies aim to open new avenues for the improvement of medicinal uses of this indigenous plant for antidepressant effect.

Materials and methods

Collection and identification of plant material

The roots of *Helicteres isora* were collected in the month of August to September around the locality of RKDF University, Bhopal (M.P.). A herbarium sheet was prepared to authenticate the plant species in the Department of Botany, Saifia College, Bhopal (M.P.). Plant material was dried under shed at room temperature and coarsely powdered stored for further use.

Extraction and phytochemical studies

The dried roots of *Helicteres isora* were collected and then moderately coarse powdered. The powdered plant material was extracted with ethanol and qualitative chemical analysis was performed for the detection of various chemical constituents such as steroids, glycosides, carbohydrates, proteins, flavonoids and amino acid.

Anti-Depressant Activity

Animals

Albino rats (180-200g) of either sex were used for complete pharmacological studies. The animals were housed in groups of six in polypropylene cages, under standard laboratory conditions of temperature (25 2°C), lighting and relative humidity (50 5%). The animals had free access to standard pellet chow (Brooke Bond-Lipton, India) and water. The animals were acclimatized for a period of minimum 7 days. The Institutional Animals Ethics Committee (IAEC) of the department approved the experimental protocol and care of laboratory animals was taken as per CPCSEA guidelines.

Preparation of extracts and fractions

Ethanolic extract of *Helicteres isora* roots was dissolved in distilled water and kept overnight so as to settle down the undissolved matter, which was filtered off later. The supernatant was fractionated with ethyl acetate (400 ml) in separating funnel (250 ml) both fractions were dried at 40^0C in rotatory evaporator up to a semisolid consistency and were utilized for the antidepressant activity.

Administration of the extracts

Suspensions of ethanolic extract was prepared in distilled water using Tween-80 (0.2% v/v) as the suspending agent. The extract was administered in a dose of 2000 mg/kg to rats by oral route, 45 min before the test procedures for pre-pharmacological screening as per OECD guidelines. Control groups were given only the vehicle (0.2% v/v Tween-80 solution) in volume equivalent to that of the plant extract.

Acute Toxicity Studies

Ethanolic extract up to dose of 2000 mg/kg is given orally for the assessment of acute toxicological studies. All the parameters were thoroughly checked and dose for the further studies was calculated as per OECD. After the conduct of acute toxicological studies the dose of each extract and the two doses were decided i.e. 200 mg/kg, 100 mg/ kg. oral route was selected for the administration of extract.

Antidepressant Activity via Forced swimming test (FST)

Rats of either sex were individually forced to swim in an open cylindrical container (diameter 10 cm, height 25 cm), containing 19 cm of water at 25±1 °C. All the rats of either sex were divided in five different groups. The first group assigned as control receiving only vehicle (NaCl 5ml/kg). The other groups received 100 and 200 mg/kg bwt dose of ethanol extract. The fourth group received standard drug Imipramine (30 mg/kg). The total duration of immobility was recorded during the last 6 min of the 10-min period. Each rat was judged immobile when it ceased struggling and remained floating motionless in the water, making only those movements necessary to keep its head above water. A decrease in the duration of immobility is indicative of an antidepressant like effect (Porsolt *et al.*, 1977).

Antidepressant Activity via Tail suspension test (TST)

All the rats of either sex were divided in four different groups. The first group assigned as control receiving only vehicle (NaCl 5ml/kg). The other three groups received acute dose of extract (100 and 200 mg/kg b wt). The fourth group received standard drug Imipramine (30 mg/kg). The total duration of immobility induced by tail suspension was measured according to the methods described by Steru *et al*., (1985). Briefly, rats both acoustically and visually isolated were suspended 50 cm above the floor by adhesive tape placed approximately 1 cm from the tip of the tail. Immobility time was recorded during a 6-min period

(Rodrigues *et al*., 2002; Mantovani *et al*., 2003). Rats were considered immobile only when they hung passively and were motionless.

Statistical Analysis

The immobility time in tail suspension test and forced swimming test was analyzed with ANOVA, further comparisons between vehicle and drug-treatment groups were performed using the Dunnett's t-test. Results are expressed as the means ± SEM. Analyses were performed using the software SPSS version 13 for windows. The level of statistical significance adopted was *P<0.05, when compared with the control group.

Results and discussion

The qualitative chemical analysis was confirmed the presence of glycosides, proteins, flavonoids and amino acid in ethanol extract. The present study done in order to investigate the pharmacological potential of *Helicteres isora*. We tried to check the activity of roots to investigate the effect of it on the central nervous system, as well as to check its activity against the various free radicals generated inside the body. The results obtained reveled the pharmacological potential of this plant and to give a scientific justification of all the activities done.

Anti-Depressant Activity

The behavioral despair model was performed in order to investigate the ability of this herbal drug in the elevation of suppressed mood, which is quite common in today's scenario. The results obtained from FST and TST clearly revels the fact that this drug is potentially quite useful in cases of depression.

The present findings suggested that ethanolic extract when administered at an acute dose of 100 and 200 mg/kg of body weight (P<0.05) reduced the immobility time by 160 and 125 sec, respectively, as compared to the immobility time of control i.e. 180 sec. The results was found comparable to the standard. The decrease in the immobility time was quite close to that of std. These results were shown that after standard i.e. Imipramine HCl (100 mg/ml) and the ethanol extract is most potent in dose dependent manner (Table 1).

Findings on tail suspension test were quite comparable to the previous FS test. As shown in the observation table and bar graph, it is quite evident that none of the drug treated animals showed excellent results compared to the standard. The immobility of Imipramine HCL (P<0.05) 100 mg/ ml was came out to be 135 sec. In this test the time of animals treated with ethanolic extract was found to be 170 sec. (P<0.05) and 140 sec at both doses when it was compared to the control group of animals which was 195 sec. The bar graph plotted revels the fact that standard treated animals showed similar response as compared to the plant extract treated groups of animals (Table 2).

The phytochemical investigation of plant extracts were showed that it contains variety of phytochemicals specially

Table 1. Immobility time in Forced swimming test (FST)

Group no.	Drug treatment	Dose mg/kg	Immobility period, mean ±S.E.M
I	Control (vehicle)	NaCl (5 ml/kg)	180 sec
II	Ethanol extract of *Helicteres isora* (EEHI)	100	*160 sec.
III	Ethanol extract of *Helicteres isora* (EEHI)	200	*125 sec.
IV	Standard group	30	*130 sec.

Values were mean ±S.E.M. for (n= 6 rats) expressed as the time (in seconds) of 6 animals in each group. Data analysis was performed using Dunnett's test. *P <0 .05 considered significant when compared with control

Table 2. Immobility time in Tail suspension test (TST)

Group no.	Drug treatment	Dose mg/kg	Immobility period, mean±S.E.M
I	Control (vehicle)	NaCl (5 ml/kg)	195 sec.
II	Ethanol extract of *Helicteres isora* (EEHI)	100	*170 sec.
III	Ethanol extract of *Helicteres isora* (EEHI)	200	*140 sec.
IV	Standard group	30	*135 sec.

Values were mean ±S.E.M. for (n= 6 rats) expressed as the time (in seconds) of 6 animals in each group. Data analysis was performed using Dunnett's test. *P <0 .05 considered significant when compared with control

we found that the ethanolic extract of *Helicteres isora* roots contain Phenolics, flavonoids, glycosides and tannins. Earlier investigations showed that this plant contains variety of flavonoidal compounds.

However, further experiments evaluating the levels of noradrenaline and serotonin in different brain regions are necessary to confirm this hypothesis. Porsolt *et al.* proposed this behavioral model for the screening of new antidepressant compounds, concluded that the immobility time observed in the test reflected a state of lowered mood or hopelessness in animals, thus, this animal model is the most widely used tool for preclinical screening of putative antidepressant agents (Cryan et al., 2002, 2005). The FST shows a strong sensitivity to monoamine alterations and is a very specific cluster of stress-induced behaviors that is not related to depression symptoms in humans, but which are nonetheless exquisitely sensitive to monoaminergic manipulations (Petit-Demouliere *et al*., 2005). It also provides a useful model to study neurobiological and genetic mechanisms underlying stress and antidepressant responses (Lucki *et al*., 2001; Nestler *et al*., 2002).

The immobility displayed by rodents when subjected to unavoidable stress such as forced swimming is thought to reflect a state of despair or lowered mood, which are thought to reflect depressive disorders in humans. In addition, the immobility time has been shown to be reduced by treatment with antidepressant drugs (Porsolt, 1985) Moreover, a significant correlation was found between the clinical efficacy of antidepressant drugs and their potency in both models (Steru, 1985, Porsolt, 1985).

In both these studies, ethanol extract significantly reduced the immobility time 160 and 125 sec. at a dose of 200 mg/kg and 100 mg/kg respectively, which was comparable to the standard group. Ethanolic extract is a complex product prepared from root. Major ingredients are polyphenols, especially flavonoids including quercetin. Recently, several studies have suggested the antidepressant effect of quercetin glycosides such as hyperoside, isoquercitrin and rutin using the positive results of FST (Noldner, 2002). Flavonoid glycosides are mostly hydrolyzed into their aglycons by mucosal and bacterial enzymes in the intestines, and then converted to conjugated metabolites during the absorption process. This perhaps indicates that the active form for the antidepressant effect of quercetin glycosides is the conjugated form, not the glycoside form (Murota and Terao, 2003). Therefore, one of the antidepressant mechanisms of EEHI is thought to involve flavonoid glycosides, which reach the brain tissues through the metabolizing process, protecting brain function from CNS disturbance, and consequently, exerting an antidepressant effect.

This effect may be because of the polyphenolics or flavonoidal content of this plant several studies have reveled that polyphenolic compounds have potent activity and they may work as an antioxidants and may be because of these might be showing the antioxidant activity.

Antidepressant effect also have major role of antioxidant effect of extract. As it is mentioned in many report that the free radicals are the cause of variety of diseases like neurodegenerative disorders, ageing, ulcer, etc. (Pong, 2003) EEHI through all the antioxidant activities screened revels that it has got antioxidant potential or free radical scavenging potential, so there one more underlying mechanism for the antidepressant activity of plant extract.

Conclusion

In conclusion, *Helicteres isora* roots was showed potent antidepressant effect possibly due to presence of flavonoid components present in ethanol extract of *Helicteres isora* roots.

References

Charles ES, Lloyd JX. 1923. The isolation and identification of Rutin from the flowers of elder (*sambucus canadensis* L.) The Journal of biological chemistry, 737-745.

Chatterjee A, Pakrashi SC. The treatise on Indian medicinal plants. New Delhi: Publications and Information Directorate; 1995.

Cryan JF, Markou A, Lucki I. 2002. Assessing antidepressant activity in rodents: recent developments and future needs. Trends Pharmacol Sci 23:238–45.

Cryan JF, Valentino RJ, Lucki I. 2005. Assessing substrates underlying the behavioral effects of antidepressants using the modified rat forced swimming test. Neurosci Biobehav Rev, 29: 547–69.

Kessler RC, McGonagle KA, Zhao S., *et al*. 1994. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Study. Arch. Gen. Psychiatry, 51:8-19.

Kirtikar KR, Basu BD. Indian Medicinal Plants. Periodical Expert Book Agency: Delhi, 1987.

Lucki I, Dalvi A, Mayorga A. 2001. Sensitivity to the effects of pharmacologically selective antidepressants in different strains of mice. J Psychopharmacology (Berl.), 155:315–22.

Mantovani M, Pertile R, Calixto JB, Santos ARS, Rodrigues ALS. 2003. Melatonin exerts an antidepressant-like effect in the tail suspension test in mice: evidence for involvement of N-methyl-D-

aspartate receptors and the Larginine-nitric oxide pathway. Neurosci Lett, 343:1–4.

Nair S, Grampurohit ND. India: SNDT Women's University; 1996. Studies on an Ayurvedic drug *Helicteres isora* Linn.

Petit-Demouliere B, Chenu F, Bourin M. 2005. Forced swimming test in mice: a review of antidepressant activity. Psychopharmacology (Berl.), 177: 245–55.

Pong K. 2003. Oxidative stress in neurodegenerative disease; therapeutic implications for superoxide dismutase mimetics. Expert Opinion in Biological Therapy, 3: 127-139.

Porsolt RD. The Origins of Depression: Current Concepts and Approaches, ed. J. Angst, pp. 313-330. Dahlem Konferenzen 1983. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag.

Porsolt RD. 1981. Behavioural despair, "Antidepressants: Neurochemical, Behavioural and Clinical Perspectives," ed. by Enna S. J., Malick J. B., Richelson E., Raven Press, New York, pp 121—139.

Porsolt RD, Bertin A, Jalfre M. 1977. Behavioural despair in mice: a primary screening test for antidepressants. Arhives Internationales de Pharmacodynamie et Therapie, 229, 327–336.

Rodrigues ALS, Silva GL, Matteussi AS, Fernandes E, Miguel O, Yunes RA *et al*. 2002. Involvement of monoaminergic system in the antidepressant-like effect of the hydroalcoholic extract of *Siphocampylus verticillatus*. Life Sci., 70:1347–58.

Steru L, Chermat R, Thierry B, Simon P. 1985. The tail suspension test: a new method for screening antidepressants in mice. Psychopharmacology, 85: 367–370.