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Research Article

Comparative Evaluation of Anti-depressant Activity of Leaves Extract of *Dendrophthoe falcata* Collected from Two Different Host Trees

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Abstract

Objective: In India, *Dendrophthoe falcata* (L.f.) Ettingsh is used in psychological effect in traditional uses. Under the family Loranthaceae, it is a parasitic plant found over different common trees like neem (*Azadirachita indica*), mango (*Mangifera indica*), guava (*Psidium guajava*), sugar apple (*Annona squamosa*), pomegranate (*Punica granatum*) etc. in all over India. A comparative study evaluated for antidepressant activity of 95% ethanolic extract of the plant hosting on two different plants namely mango and guava (DFm and DFg respectively). **Materials and methods:** The anti-depressant activity was evaluated by tail suspension method and forced swim test in wistar rats, administered DFm and DFg at dose of300 mg/kg and imipramine (30mg/kg) as standard following standard protocol. Phytochemical analysis of both plant extracts was carried out by suitable methodologies in search of active ingredient responsible for antidepressant activity and for comparative evaluation. **Results:** Both extracts showed significant anti-depressant activity in both model. DFg showed better anti-depressant activity over DFm in all model and comparable to the standard. In phytochemical analysis both extract showed presence of reducing sugar, cardiac glycosides, proteins, steroids, flavonoids, tannins, saponins but DFg showed more presence of secondary metabolites like proteins, steroids, flavonoids, tannins over DFm. **Discussion and conclusion:** DFm and DFg possess significant anti-depressant activity with presence of reducing sugar, cardiac glycosides, proteins, steroids, flavonoids, tannins, saponins. DFg shown better activity over DFg which may be due to effect of host-parasite interaction.

1. INTRODUCTION

Depression is a condition of stumpy mood and dislike to activity which can affect a person's feelings, behavior, thoughts and sense of well-being[1]. Depressed patient may experience worried, helpless, hopeless, guilty, sad, empty, irritable, restless, anxious or worthless. Patients may lose their interest in several common activities which were pleasurable to them. They experience loss of appetite, loss of concentration, problem in remembering details or making decisions and may think or attempt to suicide. Excessive sleeping, loss of sensation, digestive problems, insomnia, fatigue etc. that are resistant to treatment may also be present[2].It has been thought that Endogenous depression may occur due to a deficiency of monoamines in the cortical and limbic system, called the 'monoamine hypotheses' (serotonin, norepinephrine and dopamine). The pathophysiology of depression may also explained by a newer 'neurotrophic hypotheses'. It proposes that certain nerve factor like brain derived neurotrophic factor (BDNF) control neurogenesis. Loss of neurotrophic effects causes atrophic changes in certain part of brain and is allied with depression[3]. Different drugs available in market for treatment of depression are imipramine, amitriptyline (Tricyclic antidepressants, TCA), Phenelgine, isocarboxazide (Monoamine oxidase inhibitors, MAOI), Fluoxetine, sertraline (Selective serotonin reuptake inhibitors, SSRI), Trazodone, Nefazodone (Atypical antidepressants) but different adverse effects like sedation, postural hypotension, tachycardia associated with TCA; insomnia, dizziness, headache is associated with MAOI whereas anxiety and sexual dysfunction is associated with SSRI [4].Discovery of newer drugs to avoid unwanted adverse effects and limited efficacy of current drugs, better-tolerated and more efficacious treatments is needed. Herbal therapies could be utilized as complementary medicines in such cases[5]. In different paper it was found that the ethanol extract of different plants possess significant antidepressant activity[6,7].

There are some parasitic plants found in the nature, play an important role for their therapeutic efficacy. Under the family Loranthaceae*, Dendrophthoe falcate* (L.f.) Ettingsh[Synonym: *Loranthus falcatus* Linn. f.] is one of the most important parasitic plants which have shown versatile traditional uses. It is commonly known as 'Vanda' in 'Ayurveda'-the well utilized ancient system of Medicine in the Indian subcontinent. It was found over most common plants like mango, guava, neem etc. all over in India, Srilanka, Thialand, Indo-China, Australia as hemi-parasitic plant. The plant possesses smooth grey bark, sand, thick opposite coriaceous leaves with highly variable in size and shape most often ovate-oblong[8]. The literature survey revealed that *Dendrophthoe falcata* possesses remarkable potentials as a medicinal plant. All parts of the plant is used in conventional system of medicine as stringent, skin diseases, aphrodisiac, diuretic and also is useful in swelling wounds, treating pulmonary tuberculosis, asthma, menstrual disorders, ulcers, renal vesicle calculi and critical conditions of kapha and pitta. The decoction of plant is used by several women as an anti-fertility agent. Leaf paste of *D. falcata* is used in the treatment of skin diseases as well as it is used for setting dislocated bones in fracturing condition and also helpful in boils, extracting pus[9] along with psychological effects[10]. It was found that the plant also possess anti-oxidant, anti-microbial, wound healing[11],diuretic, antilithiatic[12] ,antioxidant and anti-nociceptive properties[13,14] . The plant was selected on the basis of reported claims by traditional healers for its effectiveness in oxidative stress[11]and psychological effects[10]. No signs of toxicity were noted in rats treated with oral dose of ethanol extract of aerial part of the plant at 2 g/kg body weight and LD_{50} was determined as 4.55 g/kg body weight orally[15].

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Based on literature search, it was found that there was no report on antidepressant activity of the leaves of *Dendrophthoe falcata*. The purpose of the present work was to investigate antidepressant activity of 95% ethanol extract of *Dendrophthoe falcata* leaves. A comparative study also made regarding the effect of different host plant for the pharmacological activity of the plant extracts.

2. MATERIAL AND METHODS

2.1 Plant material

The leaves of *Dendrophthoe falcata* were collected from two different plants hosted on two different trees namely *Mangifera indica* (mango) from Ataraulia (26°19'52"N 82°56'48"E), and *Psidium guajava*(guava), from Mehnagar ($25^0$59'N $83^0$10'E) under the District Azamgarh, Uttar Pradesh, India by Gyanendra Dubey (First author) during December 2012. Care was taken to collect only fresh, healthy leaves avoiding dried or mottled one. The botanical identification of both plants was done by Dr. S.L. Gupta, Scientist, Botanical Survey of India, Central Regional Centre, Allahabad, India. (Voucher specimen numbers GD1 and GD2 respectively). The voucher specimens were deposited in the herbarium of the Department of Pharmacology, Pharmacy College, Azamgarh, India, for future reference. The leaves were washed and air-dried separately. After complete dryness, the leaves were powdered mechanically and sieved through sieves no. 10, 20 and 40 to obtain desirable form of powder separately and stored in an air tight container for further use.

2.2 Plant Extraction

Both the powdered leaves were extracted separately with 95% ethanol in a Soxhlet apparatus up to 72 hours. The solvent was removed in a rotary vacuum evaporator (Hicon) first and then subsequently in a vacuum oven at 45°C to get the crude extract of *Dendrophthoe falcata* leaves obtained from Mango tree (DFm) and guava tree (DFg) separately for both extracts which was kept in a desicator prior to use for the pharmacological study[16].

2.3 Animals and treatment protocols

Wistar albino rats of either sex bred in the Animal House of the Department of Pharmacology, Pharmacy College, Azamgarh, weighing between 100 and 200 g were used for this study. The rats were maintained under controlled conditions (temperature, 25 ± 2°C along with a light and dark cycle of 12 h each) and they were fed a standard pellet diet along with water *ad libitum.* The animals were used for the pharmacological screening after obtaining the permission from Institutional Animal Ethics Committee, Pharmacy College, Azamgarh, India (937/c/06/CPCSEA) The animals were allocated into 4 groups (5 rats in each) and treated as follow:

1. First group treated with the vehicle (1% PEG 400 in distilled water) and served as control.
2. Second group treated with imipramine (30mg/kg) dissolved in the vehicle (1% PEG 400 in distilled water) and served as standard.
3. Third and fourth groups are treated with 300 mg/kg of dried ethanol extract of *Dendrophthoe falcata* of two origins (DFm and DFg) dissolved in 1% PEG400 respectively.

2.4 Tail suspension test (TST)

The total duration of immobility induced by tail suspension was measured according to the methods described by Steru *et al*. [17]. Briefly, rats 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. Rats were considered immobile only when they hung passively and were motionless. Reading was taken after 1 hr and 2 hr of oral administration of extract or standard drug.

2.5 Forced swim test (FST)

The Force swim test was also performed for evaluation of anti-depressant activity. In this method the rats were individually placed in glass chamber (25 × 15 × 25 cm) containing fresh water to a height of 15 cm, and maintained at 26±1 °C are forced to swim. There is no support for the animal by touching the bottom or the side walls of the chamber with their hind-paws or tail at this height of water. The duration of immobility was recorded at 6 min testing period. Evaluation was done following 30, 60 and 90 min of oral administration of extract or standard drug.Rats were considered to be immobile when they ceased struggling and remained floating motionless in water, making only those movements necessary to keep their head above water. Followed by subjecting each animal to FST the water was changed because it may alter the behavior. On completion of the experiment each test animal was towel dried and kept their housing conditions[18].

2.6 Phytochemical analysis of the plant extracts

Phytochemical analysis of both the plant extracts was carried out by suitable methodologies in search of active ingredient responsible for antidepressant activity and for comparative evaluation. The phytochemicals included under study were alkaloid, saponins, tri-terpenoids, steroids, tannins, flavonoids, cardiac glycosides, proteins, oils and free glycoside bound anthraquinones etc. including inorganic ions, was carried out according to the methodologies of Harborne(1984), Khandelwal (2006) and Stahl(1989) [19-21].

2.7 Statistical analysis

All results obtained from the pharmacological assessment were expressed as the mean ± S.E.M. The results were analyzed for statistical significance by one-way analysis of variance (ANOVA) followed by Turkey test using computerized Graph Pad In Stat version 3.06, Graph Pad Software, USA. Here, $p<0.05$ was considered as statistically significant.

4. RESULTS AND DISCUSSION

In the tail suspension test, it was found that control animal have taken 102.49 ±4.53and 103.64 ±2.94 seconds for immobilization at 1hr and 2hr respectively after oral administration of the vehicle (Table 1). Both extracts showed significant anti-depressant activity whereas ethanol extract (DFg) obtained from the plant hosted over guava tree ($p<0.01$ at 1hr and $p<0.05$ at 2hr respectively) possess better efficacy over the ethanol extract (DFm) obtained from the plant hosted over mango tree ($p<0.05$ at 1hr and $p>0.05$ at 2hr respectively).Similar result was found in forced swim test too. The result was depicted at Table 2. The DFg showed highly significant data at 30 min and 60 min like the standard ($p<0.001$). DFm showed quite significant result at 30 min ($p<0.05$) and 60 min ($p<0.01$) respectively. Imipramine showed highly significant activity in both cases (Table 1 & 2). In phytochemical analysis, it was found that both extract showed presence of reducing sugar, cardiac glycosides, proteins, steroids, flavonoids, tannins, saponins including inorganic substances like iron, sulphate, phosphate, chloride and nitrate but DFg showed more presence of secondary metabolites like proteins, steroids, flavonoids, tannins over DFm.

The present study was based upon the traditional uses of the plant. A comparative study was made in this manner to choose the specific host plant for the standardization of the plant extract for utilization in different herbal products. In the result the efficacy of plant extract hosted on guava (*Psidium guajava*) tree possess better antidepressant activity over the plant hosted over mango trees.The study also confirmed more presence of some secondary metabolite like proteins, steroids, flavonoids, tannins in DFg. It was also found that the first hour result shown better activity in compare to the second hour for all cases in TST. It can be assumed that the extract possess good metabolism to avoid unwanted effects like imipramine. DFg always showed its better efficacy over DFm in all cases in FST. *Psidium guajava* was found to be possessed antidepressant activity. It was seen that interaction between parasitic plant and various host species can have strong direct effects on both host and parasite performance, as well as marked effects on the tritrophic interaction among plant host, parasitic plant and their herbivores.It may be assumed that due to effect of host-parasite interaction, the efficacy of the hosted over guava plant possessed better activity. The study will help for finding the mechanistic approach along with its utilization as antidepressant medicinal plant.

Table 1: Effect of DFm, DFg on average response time in tail suspension test

Group	Average response time of immobility (Sec.)	
	After 1hr.	After 2hr.
Control	102.49 ±4.53	103.64 ±2.94
Standard	81.78 ±2.72***	83.82 ±3.79**
DFm	89.49 ±1.19*	94.84 ±2.64
DFg	85.73 ±2.53**	86.70±3.75*

*Data are expressed as the mean of results in 5rat ± S.E.M. *p< 0.05, **p< 0.01, ***p< 0.001 as compared to control.*

Table 2: Effect of DFm, DFg on average response time in force swim test

Group	Average response time of immobility (Sec.)		
	After 30 min	After 60 min	After 90 min
Control	99.93 ±3.15	104.66 ±3.36	98.24±4.54
Standard	77.76±2.39***	74.81±1.94***	74.21±2.96**
DFm	88.58±2.38*	85.06±5.61**	87.43±6.34
DFg	77.53±2.51***	72.85±3.14***	76.08±1.96*

Data are expressed as the mean of results in 5rat ± S.E.M. *p< 0.05, **p< 0.01, ***p< 0.001 as compared to control.

5. CONCLUSION

The result obtained from the above comparative study, indicates that the leaves extract of *Dendrophthoe falcata* from both host (mango and guava), possesses significant anti-depressant activity. On comparative evaluation it was found that the ethanol leaves extract of DFg was more effective with respect to DFm at the same dose. It may be due to present in different proportion of chemical constituent in both parasitic plants. The study also established its traditional claim.

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7. DECLARATION OF INTEREST

There is no conflict of interest in the study. All work is solely owned by the authors. There are no financial and personal relationships with other people or organizations that could inappropriately influence (bias) the work.

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