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INVESTIGATION OF ANTIDEPRESSANT ACTIVITY OF *DRACAENA TRIFASCIATA* IN RATS

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ABSTRACT

Dracaena Trifascaita extract (DTE) possesses strong antioxidant and anti-inflammatory properties that may play a vital role in treatment of mental disorders like depression. The present study was designed to evaluate the antidepressant effects of hydroalcoholic extracts of DT using standardized behavioral models of depression.

Methodology: The extracts were analyzed for phytochemical ingredients. Animals were randomly divided into 6 groups (6 animals per group): Group 1, 2 and 3 served as negative control, positive control and imipramine (25 mg/kg) standard control, respectively. Groups 4, 5 and 6 were given hydroalcoholic extract of DT orally at doses of 200 ,400 and 600 mg/ kg respectively. Following 14 days daily dosing, all animals were tested using behavioral tests of depression on day 1st,7th and14th day using Forced Swim Test (FST) and Tail Suspension Test (TST).

Results: Time of immobility was reduced in treatment group as compare to control and standard. DTE600 mg/kg showed highest and significant antidepressant effects as compare to standard drug imipramine. (25mg/kg).

Conclusion: DTE has good potential as alternative therapy for depression.

Keywords: *Dracaena Trifasciata,* Antidepressants, Force swimming test, Tail suspension test, Herbal drug of depression.

Objective: The present study was designed to evaluate the antidepressant effects of hydroalcoholic extracts of DT using standardized behavioral models of depression.

INTRODUCTION:

Depression is one of most negative cognitive neural disorder which is causing silent pandemic in our population. It is reported as the third leading cause of disability as measured by disability adjusted life years (DALYs) and is projected to became the second leading cause in 2020 (WHO 2012). Depression is defined as psychic disorder leading to tenacious feeling of sorrow, trauma, anhedonia, etc. ultimately causing significant disturbance in daily life activities. Social economic, discrimination, genetics, hormones, biological and chemical differences, trauma or stress, illness, and personality trait are common causing factor of depression. Furthermore, the life time risk of suicide in patients diagnosed with depression is as high as 6% (Inskip et al., 1998), leading to high rate of mortality and morbidity between ages of 17-29.

Since ancient times many medicinal plants have been identified for different treatments. Among which one of the plant *Dracaena Trifasciata* from the family Asparagacea, has many potentials in herbal medicines. DT is commonly known as snake plant, mother-in-law's tongue, Tigre, Buntot-tigre, and St. George's Sword. There are many pharmacological activities were reported includes cytotoxic, antioxidant, anti-diabetic, anti-fungal, and hepatoprotective. It is well known air purifier household plant that convert the carbon dioxide into oxygen by crassulacean acid metabolism. It is likely to absorb 107 types toxins such as toluene, formaldehyde, nitrous oxide, cigarettes smoke, air pollution etc.

Plant Profile:

- **Kingdom** : Plantea
- **Clade** : Tracheophytes
- **Clade** : Angiosperma
- **Clade** : Monocots
- **Order** : Asparagales
- **Family** : Asparagaceae
- **Subfamily** : Nolinoideae
- **Genus** : Dracaena
- **Species** : *Dracaena Trifasciata*

Fig. 1. *Dracaena Trifasciata* Plant

MATERIAL AND METHODS:

Collection and authentication of the plant

The plant leaves were collected from the house, Sikandra, Agra, Uttar Pradesh, India in before 2nd February, 2022. Herbarium of the plant material was authenticated at the Raja Balwant Singh College, Agra, U.P, and was confirmed by Dr. K.P. Singh, Botanist on 2 February, 2022.

Extraction of snake plant leave

The snake plant leaves were dried and powdered separated into a mixer and transferred through the sieve. In the Soxhlet apparatus (Figure 2.1) for extraction, 250g of powder was filled in apparatus. The leaves powder was extracted for 168 hours with ethanol and water (hydroalcoholic). The hydroalcoholic extracts of the snake plant leaves were dried in a "rotary evaporator" at 45℃ to produce a semi-solid mass & stored in an airtight container below 10 C in the refrigerator Shah et al.

Experimental animals

For the preserve and research on experimental animals, ethical guidelines were followed. Male Sprague Dawley rats weigh 150 to 200 grams were obtained from the animal house of Anand College of Pharmacy, Agra. They were examined for physical health before being considered for research. The animals were housed in polypropylene cages in the animal house acclimatized for 8 to 10 days one week under standard investigation laboratory environments. Animals were accommodated under constant conditions (25±2℃, humidity 40-60%, 12 hours light: 12 hours dark cycle. The animals were serves with a diet of regular foodstuffs and water ad libitum during maintenance. All the studies conducted were approved by the institutional animal ethical committee of Anand college of Pharmacy, Agra, Uttar Pradesh, according to prescribed guidelines of CPCSEA, Government of India (Reg. No. 117/1998/CPCSEA).

Preliminary phytochemical examination of plant extracts:

Phytochemical studies were evaluated by the standard protocol.

Grouping

Grouping is done for two different models including force swimming test and tail suspension test. For FST and TST model, the rats were divided into 05 groups (Containing 6 animals each) as follows:

- Group 1: control (no treatment)
- Group 2: Negative control(saline)
- Group 3: Positive(imipramine)
- Group 4: Test 1(200 mg/kg)
- Group 5: Test 2(400mg/kg)
- Group 6: Test 3(600mg/kg)

Models:

Forced swim test (FST):

The FST was performed according to the method described by Porsolt with minor modification. Rats were individually forced to swim in an open container (width 20cm, height 60 cm), with a depth of 30cm of water at 25±2°C. The experimental procedures were performed on day 1^{st}, 7^{th} and 14^{th} day, 60 min after the administration of test components orally. Each rat was judge to be immobile during 6 min. Immobility time in FST was measured as the animals ceased struggling and remained floating motionless in the water. The water in the containers was changed after each trial.

Fig. 2. Force swimming model

Tail suspension test (TST): Tail suspension test (TST): The TST was performed according to the method described by Rosa et al. The experimental procedures were performed on day 1st, 7th and 14th day, 60 min after the administration of test components orally. Rat was suspended 50 cm above the table with the help of adhesive tape placed approximately 1 cm from the tip of the tail. The total duration of immobility was scored manually during 6 min. Immobility time in TST was measured when animals did not show any limb or body movements, hung passively and completely motionless except for those movements caused by respiration

Statistical analysis

All data were expressed by mean ± SD with n=6 group. Statistical significance was determined with the help of a one-way analysis of variance (ANOVA) followed by Dennett's test. When $P<0.05$ compared to Positive control, the data is considered significant.

RESULT:

- **Yield**

Table 1: Yield value

S. no	Plant	Solvent	Yield
1	*Dracaena trifasciata*	Hydroalcoholic	32%

In comparison with the control group, changes were observed in all parameters in extract-dosed rats. There was consecutive decrease in immobility on increase in extract concentration. DT600 mg/kg showed highest and significant antidepressant effects as compare to standard drug imipramine(25mg/kg).

Phytochemical studies

- DT extract had showed the presence of reducing sugar, combined reducing sugar, tannins, flavonoid, saponin, steroids, alkaloids, glycoside, cardiac glycoside, protein, anthraquinone, and terpenoid.
- **Fresh leaves:** alkaloid and saponin is abundant. Flavonoids, tannins and cardiac glycosides are moderate.
- **Oven dried leaves:** Alkaloids, tannins and cardiac glycosides are moderate. Flavonoids and saponin are trace.
- **Room temperature dried leaves:** Alkaloids, tannins, saponins and cardiac glycosides are moderate. And flavonoids are in trace.

Table 1: Phytochemical Studies

Test	Reagent	Results
Tannin	Ferric chloride	+ (deep black)
	Dill iodine solution	+ (red solution)
Alkaloid	Hager's reagent	+ (Yellow ppt)
	Wagers reagent	+ (Brown ppt)
Flavonoid test	Heat test	+ (red-brown ppt)
	Lead acetate	+ (Yellow ppt)
	Sulphuric acid	+ (deep yellow solution; chalcones is absent)
Protein test	Biuret test	-
	Ninhydrin test	-
Carbohydrate	Molisch test	-
	Fehling(A+B)	-
Anthraquinones	Borntrager's test and modified Bontrager's test	+ (pink-red color solution)
Cardiac glycosides	3,5-dinitrobenzoic acid	+ (pink solution)
Glycosides of saponin	Froth test	+(foam)

FORCE SWIMMING TEST (FST):

In this test, animals treated with three doses of DTE (200, 400 and 600mg/kg) showed decreases in their immobility times, which was significant. in day1 DTE show the significant decrease in immobility, on day 7 DTE there was more significant decrease in immobility($p<0.01$) and on day 14th we got the most significant decrease. ($p<0.01$) DTE was compared against the standard drug imipramine(25mg/kg) ($p<0.01$)

DTE 600mg/kg showed equivalent anti-depressant activity with standard treatment(imipramine). DTE showed 18%, 26% and 40% reduced immobility on 1st day. On day 2nd 27%, 34% and 41% immobility were evaluated. And on 14th day 25%, 35% and 57% immobility were evaluated on three different doses.

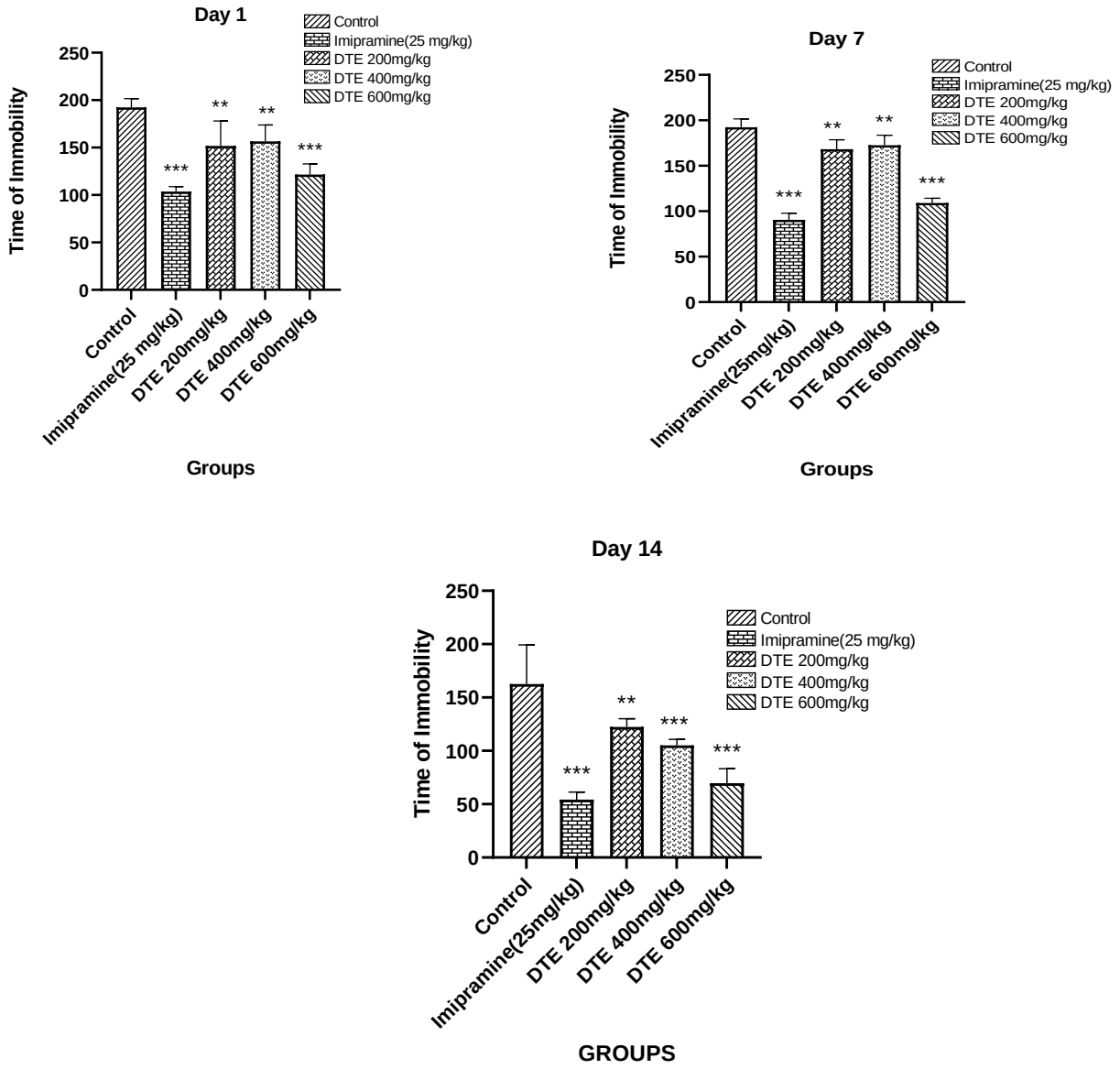
Table 2: Effect of DT Drug in FST Model

Group	Duration of Immobility (s) (Mean ± S.E.M.)		
	1st day	7th day	14th day
Control	184.2+3.734	179.8+7.664	162.6+16.37
Imipramine(25mg/kg)	114.4+3.444	92.60+3.203	54.20+3.216
DTE 200mg/kg	151.8+11.75	131.2+3.992	122.4+3.415
DTE 300mg/kg	136.2+6.689	118+2.588	105+2.550

DTE 600mg/kg	111+4.68	106.2+2.267	69.60+6.055

n= 5; representing number of animals. Values shows mean ± S.D. where values are statistically significant to *P<0.05, **P<0.01, *** P<0.001 when compared to control and standard (imipramine25mg/kg) group and one way ANOVA is followed by Post hoc Dunnet test.

Graph: Effect of DTE in FST Model Graph on 1st, 7th and 14th day



TAIL SUSPENSION TEST (TST):

DTE showed the time- dose dependent reduction in immobility in TST. When compared with control (197 ± 6.143) and standard drug (108.4 ± 2.619) DTE600mg/kg (118.4 ± 2.619) had showed the most significant reduced immobility from day 1st (P<0.001). On day 7th also DTE600mg/kg (99.20 ± 2.634) was significant and comparable with standard (90 ± 3.606) (P<0.001). On last day DTE400mg/kg (166.8 ± 7.017) and DTE 600mg/kg (85.40 ± 3.696) showed significant result with P<0.001 when compared with control (207 ± 6.168) and standard drug (63.40 ± 2.657). DTE200mg/kg is found to be not effective in all days.

DTE200, DTE400 and DTE600mg/kg showed 27%, 33% and 40% reduced immobility on 1st day. On day 2nd 13%, 38% and 49% immobility were evaluated. And on 14th day 10%, 19% and 59% immobility were evaluated on three different doses.

In this test animals treated with three doses of DTE (200,400 and 600 mg/kg, orally) showed decreases in their immobility times, which was significant ($p<0.01$). Day 1 showed the minor decrease in immobility, day 7th showed major decrease and day 14th showed maximum decrease in immobility.

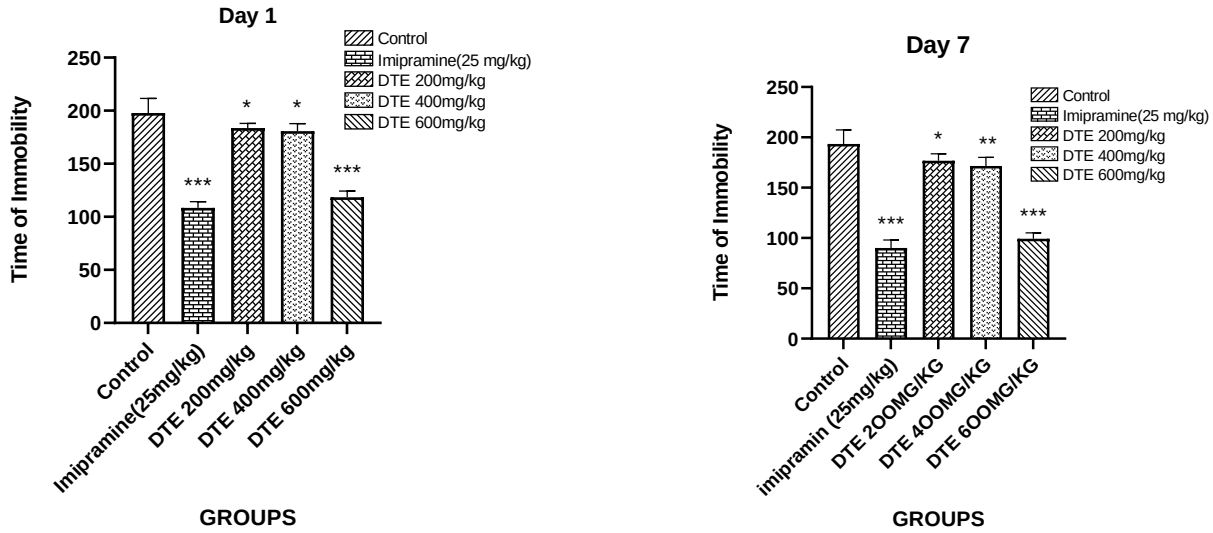
DTE 600mg/kg showed equivalent anti-depressant activity with standard treatment(imipramine)

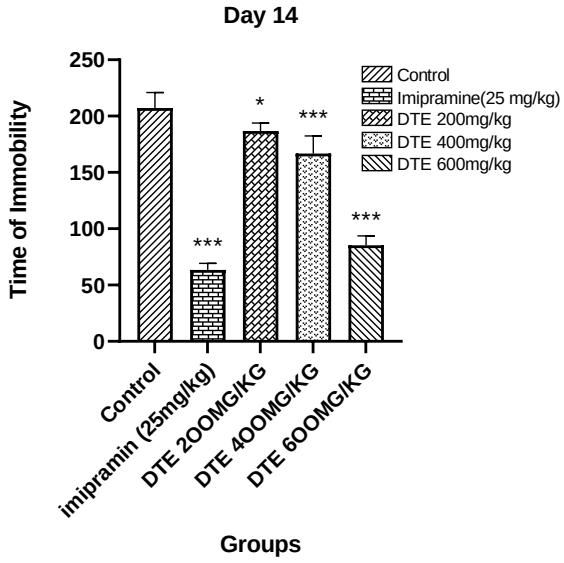
Table 3: Effect of DT extract in TST

Group	Duration of Immobility (s) (Mean ± S.E.M.)		
	1st day	7th day	14th day
Control	197+6.143	193.4+6.250	207+6.168
Imipramine(25mg/kg)	108.4+2.619	90+3.606	63.40+186.8
DTE 200mg/kg	144+2.366	168+6.535	186+3.121
DTE 300mg/kg	132.4+2.993	119.2+1.800	166.8+7.017
DTE 600mg/kg	118.4+2.619	99.20+2.634	85.40+3.696

n= 5; representing number of animals. Values shows mean ± S.D. where values are statistically significant to *P<0.05, **P<0.01, *** P<0.001 when compared to control and standard (imipramine25mg/kg) group and one way ANOVA is followed by Post hoc Dunnet test

Graph: Effect of DTE in TST Model Graph on 1ST, 7th and 14th Day





Time of immobility in seconds are expressed in Graph of control, standard, treatments groups. And Values are expressed as mean ± S.D. (n=5); where

*P <0.05, **P< 0.01, *** P< 0.001 compared to control group where consider statistically significant in one way ANOVA followed by Post hoc Dunnet test.

DISCUSSION:

Depression is one of the leading psychic disorders which is causing silent pandemic. It has emerged concern as it one of suicide leading disease. It is one of treatable disease. As herbs has emerge its potential in modern era without leaving adverse effect.

To assess the role of immobility in antidepressant action, models of behavioral tests were performed, including the force swimming test and the tail suspension test. They were used to predict the efficacy of drug at different dose including 200, 400 and 600mg/kg. Drug was administered for 14 days and model were checked at 1st, 7th and 14th day. Immobility timing of all these days were compared and calculated to evaluate the efficacy. Oral dose of DTE showed dose dependent and day dependent immobility. Dose 200 mg/kg showed the lowest efficacy and dose 600mg/kg showed the maximum efficacy. Dose 600mg/kg was evaluated with equivalent efficacy when compared with standard drug, imipramine (25mg/kg). Model shows the immobility where animal stop struggling to get rid from model. These changes may be due to neurotransmitter release.

CONCLUSION:

Overall, the findings suggest that DTE has a potential for developing an alternative plant-derived antidepressant therapy.

The present study provides the first evidence indicating that hydroalcoholic extract of *Dracaena Trifasciata* showed significant antidepressant activity in TST and FST models of depression. Further research is required to know the mechanism of its action

This is the first research to demonstrate that *Dracaena Trifasciata* hydroalcoholic extract significantly reduced depressive symptoms in both the TST and FST models of the disorder. Outcome was better for people who wants herbal treatment. Still study at molecular activities need further research

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