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Antidepressant Like Activity of Aqueous Extract of *Cymbopogon citratus* Leaves in Albino Mice.

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ABSTRACT

The study was undertaken to evaluate the antidepressant activity of aqueous extract of *Cymbopogon citratus* leaves in albino mice using forced swim and tail suspension test. The study comprised of five treatment groups all with six animals in each group. Group I was normal control, group II was imipramine (10mg/kg) and group III, IV and V received *Cymbopogon citratus* orally at the dose of 100 mg/kg, 200 mg/kg and 400 mg/kg respectively. Drugs were given one hour before the experiment in acute study, whereas for chronic study drugs were given for 14 days and experiment was carried out one hour after administration of the drug on the 14th day. The duration of immobility was compared between groups. At the end of the study, in forced swim test, acute and chronic treatment with *Cymbopogon citratus* at all three doses showed a significant reduction in duration of immobility when compared to normal control. In tail suspension test, acute treatment with *Cymbopogon citratus* did not show significant reduction in duration of immobility when compared to normal control at all three doses. But in chronic study, 100mg/kg and 200mg/kg groups showed a significant decrease in duration of immobility when compared to normal control.

Keywords: Depression, *Cymbopogon citratus* (Lemon grass), Imipramine, Forced swim test, Tail suspension test.

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INTRODUCTION

There has been a tremendous socioeconomic transformation in both affluent and developing countries, which has dramatically changed the lifestyle of people. Consequently, life has become stressful leading to depressive disorders like major depression and dysthymia, which are disabling illnesses. Depressive disorders are one of the most common mental illness affecting about 20% of the population at some point in their lives. [1]

Major depression is a heterogeneous disorder that affects a person's mood, physical health and behavior. Symptoms include guilt, anhedonia, disturbed appetite, insomnia, aches, fatigue, lack of concentration and suicidal tendency. Depression goes undiagnosed and untreated in majority of the patients [2]. Despite progress in pharmacotherapy, antidepressants used in the treatment of depression have delayed onset of action and a myriad of adverse effects [3]. The high mortality rate associated with depressive disorders has led to the search for safer and more effective anti-depressants [4].

In traditional medicine, herbs have been used as therapeutic agents to manage neurological disorders such as major depression, anxiety disorders, epilepsy, insomnia, dementia and drug abuse [5]. Therefore, it is worthwhile to explore the utility of these herbs for the treatment of various depressive disorders.

Cymbopogon citratus (Lemon grass) is a widely used herb, native to India. *Cymbopogon* derives its name from the Greek words "kymbe" meaning boat and "pogon" meaning beard, referring to the flower spike arrangement. It is a genus of about 55 species and belongs to the family Poaceae [6]. The plant is used as a fragrance and flavoring agent and in folk medicine as an antispasmodic, hypotensive, anticonvulsant, analgesic, antiemetic, antitussive, antirheumatic, antiseptic and treatment for nervous and gastrointestinal disorders and fevers. The plant is also used as an antibacterial, antidiarrheal and antioxidant, but the mode of action for the different bioactivities has not been studied in detail. *Cymbopogon citratus* contains various phytoconstituents such as flavonoids and phenolic compounds, terpenoids and essential oils, which may be responsible for the different biological activities. Hence, we can isolate some pure phytopharmaceuticals, which in turn can be used as lead molecules for synthesizing the novel agents having good therapeutic activity [7]. Therefore this study aimed to evaluate the antidepressant like activity of aqueous extract of *Cymbopogon citratus* in Swiss albino mice.

MATERIALS AND METHODS

The study was carried out after obtaining permission from the institutional animal ethics committee and performed according to the guidelines of CPCSEA.

Animals

Adult male albino mice (Swiss strain) weighing 25–30g, bred in the institutional animal house was used. Animals were housed in clean polypropylene cages in groups of 3 each and maintained on a natural day/night cycle at room temperature of about 24-26°C. They were fed with commercial pelleted chow and water *ad libitum*. For a week these animals were allowed to acclimatize and then experiments were performed during the light phase of the cycle (10:00 a.m.-17:00 p.m.).

Drugs and Dosage

The **s**tudy drug was aqueous extract of *Cymbopogon citratus* leaves (100mg/kg, 200 mg/kg and 400 mg/kg, orally) which was prepared by using the soxhlet apparatus. Imipramine was used as a standard drug at a dose of 10mg/kg, orally.

Study procedure

Thirty animals were randomly assigned to 5 groups (n=6 animals per group). Group I served as normal control and distilled water was given at a dose of 10ml/kg/day, group II received imipramine (10mg/kg) and group III, IV and V received aqueous extract of *Cymbopogon citratus* orally at the dose of 100 mg/kg, 200 mg/kg and 400 mg/kg [8] respectively. All the drugs are administered orally. Drugs were given one hour before the

experiment in the acute study, whereas for chronic study the drugs were given for 14 days and experiment was carried out on the 14th day, one hour after the administration of the drug.

Animal models for testing antidepressant activity

Forced Swim Test (FST)

The experiment was performed according to the method described by Porsolt et al. Animals were placed individually in 5-liter glass jar (25 cm height x 12 cm diameter), filled with fresh water to a height of 15 cm. The duration of the test was 6 minutes and immobility was recorded during the last 4 minutes of the test. Animals were considered immobile if floating motionless or making only those efforts necessary to keep the head above water surface. Each animal was used only once and the water was changed after each test [9]. Duration of immobility was measured to evaluate the antidepressant activity of the compound.

Tail Suspension Test (TST)

Tail suspension test was performed according to the method described by Steru et al. Each animal was suspended on a plastic string, at a height of 75 cm above the table top with an adhesive tape placed approximately 1cm from the tip of the tail. Duration of immobility was recorded for 6 minutes and animals were considered immobile only when they hang passively and completely motionless. [10].

Statistical Analysis

The data was analyzed using SPSS (Statistical Package for the Social Sciences) version 16 and results were expressed as mean ± SD. Analysis was done between the groups and compared using One-way ANOVA followed by Tukey's test. P <0.05 was considered significant.

RESULTS

Forced swim test

Effect of acute and chronic treatment of aqueous extract of *Cymbopogon citratus* on duration of immobility in forced swim test is shown in Table 1. In both the acute and chronic study, *Cymbopogon citratus* 100mg/kg, 200mg/kg and 400mg/kg group showed significant reduction in duration of immobility when compared to normal control group. *Cymbopogon citratus* in a dose of 100mg/kg and 200mg/kg showed a greater decrease in duration of immobility when compared to test 400mg/kg group.

Table 1: Duration of immobility in forced swim test.

Group	Dose	Duration of immobility (seconds)	
		Acute study	Chronic study
Normal Control	10 ml/kg	121 ± 10.60	127 ± 7.33
Imipramine	10 mg/kg	25 ± 6.41*	13 ± 3.63*
Cymbopogon citratus	100 mg/kg	75 ± 30.28*	46 ± 22.72*
Cymbopogon citratus	200 mg/kg	74 ± 16.62*	42 ± 18.90*
Cymbopogon citratus	400 mg/kg	84 ± 17.25*	68 ± 19.53*

All values are expressed as Mean±SD, *p<0.05 vs control group

Tail suspension test

Effect of acute and chronic treatment with aqueous extract of *Cymbopogon citratus* on duration of immobility in tail suspension test is shown in Table 2. In the acute study, *Cymbopogon citratus* at all three doses did not show a decrease in duration of immobility when compared to normal control group. In the chronic study, only 100mg/kg and 200mg/kg dose groups showed a significant decrease in duration of immobility when compared to normal control.

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Table 2: Duration of immobility in tail suspension test

Group	Dose	Duration of Immobility time (seconds)	
		Acute study	Chronic study
Normal Control	10 ml/kg	247.50 ± 12.07	256.00 ± 8.09
Imipramine	10 mg/kg	103.80 ± 12.17*	32.16 ± 11.61*
Cymbopogon citratus	100 mg/kg	221.17 ± 7.19	125.83 ± 6.17*
Cymbopogon citratus	200 mg/kg	269.50 ± 57.84	159.50 ± 33.13*
Cymbopogon citratus	400 mg/kg	245.50 ± 17.89	251.00 ± 17.56

All values are expressed as Mean±SD, *p<0.05 vs control group

DISCUSSION

Depression occurs due to changes in monoamine transmitters in the brain, specifically norepinephrine, serotonin and dopamine [11]. Although development of new drugs has led to improvements in clinical outcomes, this has come at the cost of safety. [12] *Cymbopogon citratus* is a commonly used herb in India for treating various illness and has shown to have a number of active phytoconstituents [6].

In our study, *Cymbopogon citratus* 100mg/kg, 200mg/kg and 400mg/kg group showed a significant antidepressant activity when compared to normal control group in both acute as well as chronic study in forced swim test. In tail suspension test, only in chronic study 100mg/kg and 200mg/kg group showed a significant antidepressant activity when compared to normal control. All three doses of the test drug showed no significant antidepressant activity compared to imipramine in acute as well as chronic study in both forced swim and tail suspension test. The antidepressant activity was significantly higher on chronic administration compared to acute administration and test drug at a dose of 100mg/kg and 200mg/kg showed maximum antidepressant activity. This may be because *Cymbopogon citratus* reached the plateau dose so further increase in dose may not be useful.

An imbalance between oxidative stress and antioxidant defenses, leads to the oxidation of lipids, proteins, and nucleic acids. These reactive oxygen species are implicated in the progression of depression and poor health outcomes. Use of antioxidants claim to counter the effects of these reactive oxygen species leading to better clinical outcomes. [13]. *Cymbopogon citratus* contains antioxidants, phenols/flavonoids like luteolin, isoorientin 2'-O-rhamnoside, quercetin, kaempferol and apiginin [7]. The antidepressant effect of this herb could be attributed to the above phytoconstituents, but the precise mechanism is not completely understood. Hence further studies are required to understand its mechanism of action.

The health benefits of *Cymbopogon citratus* on depression is a less touched field and in the current global health scenario, plants with medicinal value have garnered interest from all quarters. This information paves the way for scientists to isolate pure phytopharmaceuticals which can be used as lead compounds to develop novel drugs in the treatment of depression.

CONCLUSION

Aqueous extract of *Cymbopogon citratus* in acute & chronic treatment showed antidepressant activity in both FST & TST models of depression in mice. It may have a beneficial effect in depressive disorders and can be considered as an add-on therapy for the same.

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