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RESEARCH ARTICLE

The antidepressant activity of alcoholic extract of *Withania coagulans* fruits in Swiss albino mice by tail suspension test

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ABSTRACT

Background: There are many antidepressant drugs used today have the adverse drug reactions. *Withania coagulans* – a species to be extinct, is not explored much for its effects on mood except in late seventies. As a result, it was thought worthy to explore antidepressant activities of alcoholic extract of *W. coagulans* fruits in Swiss albino mice (SAM) using tail suspension test (TST). **Aim and Objective:** This study aims to study the alcoholic extract of *W. coagulans* fruits' antidepressant effect in SAM by TST. **Materials and Methods:** TST was used for evaluating the antidepressant action of *W. coagulans* fruits alcoholic extract. If the extract had antidepressant action, then it was estimated that the period of mobility would rise and immobility would reduce. This reduction in immobility, if found statistically significant, was considered for antidepressant action. **Results:** There was statistically substantial ($P < 0.001$) association observed between alcoholic extract of *W. coagulans* fruits with depressant action on mood in SAM by TST. **Conclusion:** The alcoholic extract of *W. coagulans* fruits did not prove antidepressant action in SAM. On the other hand, it showed depressive effect on the mood in the TST.

KEY WORDS: Antidepressant; Swiss Albino Mice; *Withania coagulans*; Tail Suspension Test

INTRODUCTION

The depression affects the daily life and normal working. Symptoms of depression are sad mood, feeling of hopelessness and or guilt, loss of interest, decreased energy, concentration difficulty, sleeping difficulty, appetite loss, suicidal thoughts or attempts, restlessness, persistent physical symptoms, etc. About 350 million people globally are suffering from depression.[1] The gravity of problem can be understood from the fact that about 1 in 20 people reported had an episode of depression previously.[1]

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There are numerous allopathic medicines existing for the treatment of depression which act on neurotransmitters involved in major depressive disorder such as norepinephrine, dopamine, and serotonin (5-HT). However, these medicines cause many adverse drug reactions. In the tail suspension test (TST), the immobility time in mice can be related to the depressive symptoms in humans. Conversely, rise in mobility time in mice can be demonstrated with administration of antidepressive drugs.[2] This phenomenon of TST can be applied for determining the efficacy of antidepressive drugs.

Withania coagulans (Rishyagandha) is considered as "vulnerable species."[3] Therefore, there is scarcity in the availability of this species. As a result, not much work is done on this plant to see the outcome on mood. In 1977, Budhiraja *et al*. testified central nervous system (CNS) depressant effect of this herb.[4] Later, very little work was done to discover its CNS activity, yet lot of work was done on diabetes and

other diseases. Thus, it was thought sensible to explore antidepressive actions of alcoholic extract of *W. coagulans*.

MATERIALS AND METHODS

Control, Standard, and Test Drugs

For control, distilled water was given as vehicle. As the standard drug, imipramine was used. The animals were treated 30 min before the experiment with the test drugs (WCFAlcE of 200 mg/kg, 500 mg/kg, and 1000 mg/kg doses p. o.). However, the test drugs were administered every day for 30 days throughout the period of experiment. The mice were observed for 5 min. On day 1, day 8, day 15, day 23, and day 30, the recordings were taken for all the groups. After half an hour drug administration to the respective group, the recordings were taken.

Drugs were given in the following manner in the tail suspension model of antidepressant activity:

- Control: Vehicle (distilled water) 2 ml/kg p. o. once a day for 30 days
- Standard: Standard drug (imipramine) 15 mg/kg i. p. once half an hour before test
- ALC-200: WCFAlcE 200 mg/kg p. o. once a day for 30 days
- ALC-500: WCFAlcE 500 mg/kg p. o. once a day for 30 days
- ALC-1000: WCFAlcE 1000 mg/kg p. o. once a day for 30 days.

Where, WCFAlcE = *W. coagulans* fruits alcoholic extract

TST

Each mouse was individually suspended 50 cm above the surface of Table 1 with an adhesive tape positioned 1 cm from the tip of the tail. After 1 min of acclimatization, immobility duration was recorded for 5 min. Mice were considered immobile only when they suspended passively and were thorough motionless. The index of depression in this experimental model was taken as the immobility period over a specified time. When an antidepressant drug was given, it was anticipated that the period of mobility would rise and immobility would reduce compared to that of control.

Source of Support

This study was conducted at Mahatma Gandhi Institute of Medical Sciences (MGIMS), Sevagram.

Ethical Approval

The study was approved by Institutional as well as the Animal Ethics Committee of MGIMS, Sevagram.

RESULTS

As shown in Table 1, on day 1 and day 8, there were no statistically significant differences observed in both the parameters such as the average time spent by mice in active movement (mobility) and average time spent by mice by staying motionless (immobility) for all the three doses of 200 mg/kg, 500 mg/kg, and 1000 mg/kg of WCFAlcE compared to control. However, on day 15, day 23, and day 30, there were statistically highly significant differences observed in both the parameters of mobility and immobility for all the three doses of 200 mg/kg, 500 mg/kg, and 1000 mg/kg of WCFAlcE compared to control.

Mobility

As elucidated from Table 1, the average mobility period by the mice in the TST reduced highly significantly ($P < 0.001$) on days 15, 23, and 30 for all the three doses of 200 mg/kg, 500 mg/kg, and 1000 mg/kg of WCFAlcE compared to control. Furthermore, the dose–response relationship was noted for this decrease. In contrast, for the standard, highly significant rise was observed for the same.

Immobility

As clarified from Table 1, the average immobility period by the mice in the TST rose highly significantly ($P < 0.001$) on days 15, 23, and 30 for all the three doses of 200 mg/kg, 500 mg/kg, and 1000 mg/kg of WCFAlcE compared to control. Furthermore, the dose–response relationship was observed for this rise. On the other hand, for the standard, highly significant reduction was observed for the same.

DISCUSSION

As observed in Table 1, the average mobility period by the mice in the TST decreased highly significantly ($P < 0.001$) on days 15, 23, and 30 for all the three doses of 200 mg/kg, 500 mg/kg, and 1000 mg/kg of WCFAlcE compared to control. Furthermore, the dose–response relationship was observed for this decrease. In contrast, from Table 1, immobility period increased highly significantly ($P < 0.001$) for above doses on those days.

There are no previous studies reported which studied *W. coagulans* effect on the TST in mice. However, Bhattacharya *et al*. proved that *Withania somnifera* glycowithanolide (similar species as that of *W. coagulans*) decreased the forced swimming induced immobility time in rodents.[5] Furthermore, Kamdi *et al*. studied the antipsychotic activity of alcoholic extract of *W. coagulans* fruits in Swiss albino mice (SAM) in haloperidol-induced catalepsy.[6] Moreover, Kamdi *et al*. explored the antidepressant activity of alcoholic extract of *W. coagulans* fruits in SAM by forced swimming test.[7]

Table 1: Effect of oral administration of WCFAlcE on time spent in seconds (Mean±SD) in mobility and immobility positions in the TST. (*n*=6 in each group)

Variables	Control	Standard	ALC-200	ALC-500	ALC-1000
Day 1					
Mobility	132.66±6.08	121.50±24.48	135.83±22.38	130.50±17.82	128.16±17.63
Immobility	167.33±6.08	178.50±24.48	164.16±23.38	169.50±17.82	171.83±17.63
Day 8					
Mobility	139.33±7.20	173±32.82*	129.50±55.47	137.66±55.47	142.33±41.38
Immobility	160.66±7.20	127±32.82*	170.50±55.47	162.33±55.47	157.66±41.38
Day 15					
Mobility	145.16±13.07	201.83±9.26***	111.66±6.68***	107.66±12.54***	100.16±9.02***
Immobility	154.83±13.07	98.16±9.26***	188.33±6.68***	192.33±12.54***	199.83±9.02***
Day 23					
Mobility	130.50±9.69	224±35.44***	84±14***	81.83±18.37***	74±14.69***
Immobility	169.50±9.69	76±35.44***	216±14***	218.16±18.37***	226±14.69***
Day 30					
Mobility	136.83±14.83	239.33±21.09***	52.16±7.30***	49.50±9.13***	43.66±12.54***
Immobility	163.16±14.83	60.66±21.09***	247.83±7.30***	250.50±9.13***	256.33±12.54***

* $P<0.05$, ** $P<0.01$, and *** $P<0.001$ when compared to control group. WCFAlcE: *Withania coagulans* fruits alcoholic extract, Mobility: Time spent by mice in active movement, Immobility: Time spent by mice by staying motionless, Control: Vehicle (distilled water) 2 ml/kg p. o. once a day for 30 days, Standard: Standard drug (imipramine 15 mg/kg) i. p. half an hour before test, ALC-200: WCFAlcE 200 mg/kg body weight p. o. once a day for 30 days, ALC-500: WCFAlcE 500 mg/kg body weight p. o. once a day for 30 days, ALC-1000: WCFAlcE 1000 mg/kg body weight p. o. once a day for 30 days. TST: Tail suspension test

TST is the best test for screening of antidepressant drugs.[8] Its benefit over forced swim test is that there is no risk of hypothermia due to submersion in water.[9] The immobility displayed by mice when exposed to an unavoidable and inescapable stress had been claimed to reflect behavioral despair which is equivalent to depressive disorders in humans. Hence, immobility time is used for the assessment of the results.[10]

CONCLUSION

From the above test results, it is obvious that WCFAlcE did not show the antidepressant activity on mood. On the other hand, it might display the depressant action on the mood. However, TST is used for the screening of antidepressant drugs. We cannot extrapolate the depressant action of the test substance. Therefore, the extract needs to be tested on depressant models of rodents.

REFERENCES

1. Marcus M, Yasamy MT, Van Ommeren M, Chisholm D, Saxena S. Depression: A global public health concern. WHO Dep Ment Health Subst Abuse 2012;1:6-8.
2. Petit-Demouliere B, Chenu F, Bourin M. Forced swimming test in mice: A review of antidepressant activity. Psychopharmacology (Berl) 2005;177:245-55.
3. Pandey RP, Meena SL, Padhye PM, Singhadiya MK. A review of depleting plant resources, their present status and conservation in Rajasthan, India. In: Biological Forum. New Delhi: Satya Prakashan; 2012. p. 213-30.
4. Budhiraja RD, Bala S, Garg KN. Pharmacological investigations on fruits of *Withania coagulans*, Dunal. Planta Med 1977;32:154-7.
5. Bhattacharya SK, Bhattacharya A, Sairam K, Ghosaf S. Anxiolytic-antidepressant activity of *Withania somnifera* glycowithanolides: An experimental study. Phytomedicine 2000;7:463-9.
6. Kamdi AS, Kokane S, Bohra PN, Kalambe SM. The antipsychotic activity of alcoholic extract of *Withania coagulans* fruits in Swiss albino mice in haloperidol-induced catalepsy. Natl J Physiol Pharm Pharmacol 2018;8:1654-6.
7. Kamdi AS, Bohra PN, Kalambe SM, Chandrakapure AR. The antidepressant activity of the alcoholic extract of *Withania coagulans* fruits in Swiss albino mice by forced swimming test. Natl J Physiol Pharm Pharmacol 2019;9:904-6.
8. Crowley JJ, Blendy JA, Lucki I. Strain-dependent antidepressant-like effects of citalopram in the mouse tail suspension test. Psychopharmacology (Berl) 2005;183:257-64.
9. Thierry B, Stéru L, Simon P, Porsolt RD. The tail suspension test: Ethical considerations. Psychopharmacology (Berl) 1986;90:284-5.
10. Steru L, Chermat R, Thierry B, Simon P. The tail suspension test: A new method for screening antidepressants in mice. Psychopharmacology (Berl) 1985;85:367-70.

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