

ANTI-COMPULSIVE EFFECT OF ETHANOL EXTRACT OF *Stuednera colocasiifolia* K. KOCH LEAVES ON MARBLE-BURYING BEHAVIOR IN MICE

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ABSTRACT

Objective: The present study was to evaluate the anti-compulsive effect of ethanol extract of *Stuednera colocasiifolia* K. Koch leaves. **Methods:** The experiment was conducted in specific animal models of Swiss albino mice to evaluate marble-burying behavior. **Results:** Oral administration of 100 and 200 mg/kg of ethanol extract of *S. colocasiifolia* (EESC) significantly ($P < 0.01-0.05$) decreased the total number of buried marbles. The effect was comparable to that of the Imipramine hydrochloride (10 mg/kg). Imipramine hydrochloride and EESC do not produce any overt motor dysfunction. **Conclusions:** The results of the study for the first time show that the plant possesses anti-compulsive activity. Future research should focus on the identification and the mechanism of action of the constituents from this plant.

KEYWORDS: *Stuednera colocasiifolia* K. Koch, anti-compulsive, Imipramine hydrochloride, marble-burying.

INTRODUCTION

Obsessive-compulsive disorder (OCD) is a disabling psychiatric condition characterized by the presence of upsetting, persistent thoughts, images, or impulses that are experienced as

intrusive and senseless, and which cause marked distress or anxiety (obsessions) and/or excessive repetitive intentional behaviors or mental acts (compulsions) intended to neutralize this distress (Brown and Barlow, 2005). The disorder has a lifetime prevalence of 2.3% (Kessler et al., 2005), and it significantly interferes with social adjustment, employment, marriage, family relationships, and socioeconomic status (Murray and Lopez, 1997; Markarian et al., 2010).

Marble-burying behavior of mice simulates some aspects of obsessive-compulsive behavior; therefore, it is often used to screen anti-compulsive drugs due to high predictive and good face validity (Joel, 2006). In both natural and laboratory conditions, rats and mice spontaneously use the available bedding material to bury unpleasant sources of discomfort present in their home environment (Archer et al., 1987). Burying behavior consists in forward shoving the diggable material over the source of aversion, using the snout and forepaws in order to avoid and protect from the localized threat (Poling et al., 1981). This characteristic behavior, which is usually directed toward several classes of harmful and noxious objects such as food associated with unpleasant taste, small predators such as scorpions, dead conspecifics or electrified prod, is described as a defensive behavior reflecting the anxiety state of animals (Wilkie et al., 1979; Treit, 1990). However, whereas the defensive nature of marble-burying behavior is still actively debated, the mouse marble-burying test has been used as a screening model for the detection of anxiolytics.

Steudnera colocasiiifolia K. Koch (family: Araceae) is an evergreen herb, which is short Stem, creeping and ascending; persistent cataphylls brown, not netted. Petiole green, cylindrical, 30–50cm, slender, base sheathing; leaf blade paler but not glaucous abaxially, green adaxially (Takenaka et al., 2006). It is habitat in dense forests, wet meadows, by streams. Seasonally moist lowland forest. Distributed in Bangladesh, India, Myanmar, Thailand and China. Locally it is used to treat injuries, cuts, snake and insect bites and skin ulcers. Whole plant extract of *S. colocasiiifolia* has anti-arthritic, anti-inflammatory and analgesic activities (Hossain et al., 2015; Kabir et al., 2015).

The aim of the present study was to anti-compulsive effect of *Steudnera colocasiiifolia* leaves extract by using marble-burying model in mice. However, no earlier studies have been conducted experimentally to characterize the anti-compulsive effect of this plant.

MATERIAL AND METHOD

Plant material

Fresh leaves of *Stuednera colocasiifolia* (voucher specimen ID. No: 1316 CTGUH) were collected from Alu tila, khagrachari, Chittagong, Bangladesh in the month of September 2014. It was authenticated by Dr. Shaikh Bokhtear Uddin, Associate Professor, Department of Botany, University of Chittagong, Chittagong-4331, Bangladesh.

Preparation of Extract

The leaves were dried for a period of 10 days under shade and ground. The ground leaves (250 mg) were soaked in sufficient amount of ethanol for one week at room temperature with occasional shaking and stirring then the whole mixture was filtered and the filtrate thus obtained was concentrated using a rotary evaporator (Bibby RE200, Sterlin Ltd, UK) to get a viscous mass. The viscous mass was kept at room temperature under a ceiling fan to get a dried extract (about 7%). The extract prepared was for pharmacological screening.

Experimental animals

Swiss albino mice, weighing about 25–30 g, were collected from Jahangir Nagar University, Savar, Bangladesh. The animals were furnished with standard lab nourishment and refined water ad libitum and maintained at natural regular day-night cycle having legitimate ventilation in the room. All the experiments were conducted in an isolated and noiseless condition. The study protocol was approved by the P&D Committee, Department of Pharmacy, International Islamic University Chittagong, Bangladesh. The animals were acclimatized to laboratory condition for 7 days prior to experimentation.

Preparation of test doses

The extracts were suspended in the vehicle. Various strengths were prepared from a stock solution 40 mg/ml. the solutions were prepared freshly solutions were administered orally.

Assessment of marble-burying behavior

The anti-compulsive effect was assessed by the widely used model of studying the marble-burying behavior of mice (Njung'e and Handley, 1991; Njung'e and Handley, 1991). Marble-burying behavior of mice was studied as described previously (Uday et al., 2007). In brief, each mouse was individually placed in a plastic cage (21 × 38 × 14 cm) containing 5-cm thick sawdust bedding. Twenty small glass marbles (diameter 10–12 mm) were arranged on the bedding, evenly spaced in four rows. After 30 minute exposure, the number of unburied

marbles was counted. A marble covered at least two-third of its size by saw dust was considered as “buried”.

Statistical analysis

The results were expressed as the mean±SEM. The results were statistically analyzed using repeated measures analysis of variance with Dunnett’s multiple comparison when compared against control. All analyses were performed using the SPSS statistical software. The levels of statistical significance ranged from $P < 0.05$ to $P < 0.001$.

RESULTS

Effect on marble-burying behavior in mice

Ethanollic extract of *S. colocasiifolia* leaves (100 and 200 mg/kg.) dose dependently reduced marble-burying behavior in mice, which was presented in Table 1 and the reduction was significant ($P < 0.01$) as compared to control group. Imipramine hydrochloride, at a dose of 10 mg/kg, also showed significant ($P < 0.01$) reduction in the number of buried marbles. All data showed in Table 1, Figure 1.

Table 1: Effect of *S. colocasiifolia* leaves extract on marble-burying behavior in mice.

Treatment	No of Marbles buried	% decrease
Control (1% tween)	16.67±0.615	-
Imipramine hydrochloride (10mg/kg)	4.50±0.428 ^b	73.00
EESC (100mg/kg)	11.00±0.577 ^a	34.01
EESC (200mg/kg)	7.33±0.494 ^b	56.03

EESC=Ethanol extract of *S. colocasiifolia*; ^a $P < 0.05$, ^b $P < 0.01$ as control. Dunnett’s test as compared to control (1% tween).

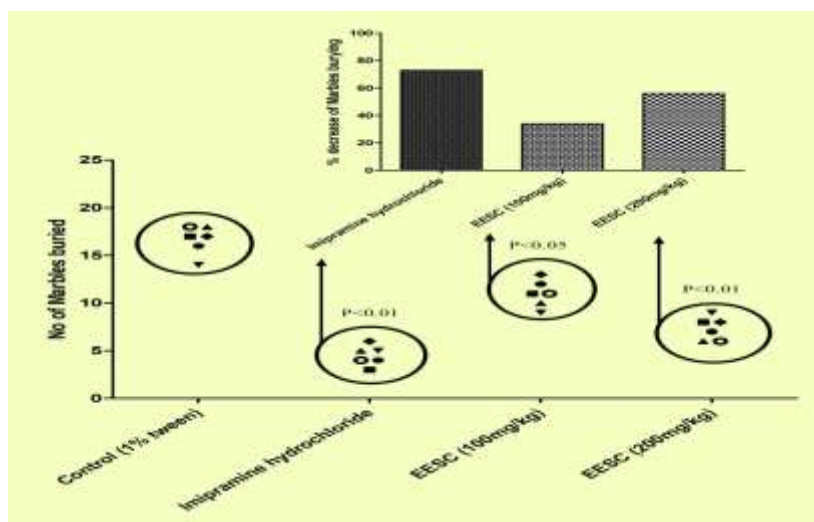


Figure 1: Effect of *S. colocasiifolia* leaves extract on marble-burying behavior in mice.

EESC=Ethanol extract of *S. colocasiifolia*; ^aP<0.05, ^bP<0.01 as control. Dunnett's test as compared to control (1% tween).

DISCUSSION

This is the first report to show that *S. colocasiifolia* leaves can modulate the compulsive behavior. These studies were carried out by employing an animal model, and the marble-burying behavior of mice was considered as the marker index of compulsive behavior characteristically evident in Obsessive-compulsive disorder (OCD). Marble-burying behavior is an unconditioned, specific defensive reaction in rodents, which is not associated with physical danger and does not habituate upon repeated testing (Njung'e and Handley, 1991). In male mice, it is markedly attenuated by acute administration of SSRI and tricyclic antidepressants (Ichimaru *et al.*, 1995). These observations suggest that the burying behavior in male mice models can be useful for evaluation of compulsive behavior rather than anxiety (Millan *et al.*, 2001). Therefore, this paradigm was employed in the present investigations. The present study revealed that *S. colocasiifolia* leaves extract (100 and 200 mg/kg.) reduced marble-burying behavior and the effect was comparable with that of Imipramine hydrochloride (10 mg/kg).

CONCLUSION

Our present study revealed that *Steudnera colocasiifolia* possesses significant anti-compulsive effect, due to its active chemical constituents. However, further studies are required to confirm the mechanism of action behind the effects observed in our study.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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