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Research Article

EFFECT OF AQUEOUS EXTRACT OF *CYNODON DACTYLON* ON RESERPINE INDUCED CATALEPSY.

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ABSTRACT

The aqueous extract of *Cynodon dactylon* (AECD) Pers. (Graminae) was evaluated for anti-cataleptic activity in mice. In the present study, anti-cataleptic activity of AECD at different doses was studied using reserpine (2.5 mg/kg, i.p.) induced catalepsy. The study was carried out at two different dose levels of AECD, namely 150 and 300 mg/kg given as a single dose intraperitoneally. The extract was found to reduce catalepsy significantly ($p<0.001$) as compared to the reserpine treated mice showing greater effect at 300 mg/kg i.p. dose. Thus the present study reveals the anti-cataleptic activity of AECD.

Keywords: *Cynodon dactylon*, Catalepsy, Reserpine, Mice, Intraperitoneally.

INTRODUCTION

Parkinson's disease (PD) is the most prevalent neurodegenerative disorder caused by a progressive loss of dopaminergic (DA-ergic) neurons in substantia nigra pars compacta (SNpc)[1] and the development of fibrillar cytoplasmic inclusions containing α-synuclein and ubiquitin[2,3]. It is mainly characterized by four cardinal features which are bradykinesia, resting tremor, rigidity (stiffness of limbs) and postural reflex impairment (gait or balance problem)[4,5,6]. PD was first described by James Parkinson in 1817 as paralysis agitans, or the "shaking palsy"[7,8]. Several factors are responsible for the neurodegeneration like mitochondrial complex-1 inhibition[9,10], interaction between environmental and genetic factors[11], environmental toxins like metals[12,13], proteosomal dysfunction[14] and microglial activation[15,16].

Free radicals generated due to these defects could be responsible for the oxidative damage in dopamine metabolism[17], resulting in generation of reactive oxygen species[18,19]. The reduced levels of endogenous antioxidant molecules such as glutathione (GSH) and superoxide dismutase (SOD), increased levels of nitric oxide (NO), citrulline and lipid peroxidation product malondialdehyde (MDA) in the brain could lead to neuronal death[20]. These conditions lead to the requirement of using antioxidants as a treatment in PD in addition to other protective agents.

Cynodon dactylon Pers. (Family: Graminae) is a creeping grass found in warm climates all over the world between about 45º south and north altitude[21]. It is also known as Durva Grass, Bermuda grass, Dog's tooth grass, Bahama grass, Devil's grass, Couch grass, Indian doab, Grama and Scutch grass. The plant contains crude proteins, carbohydrates and mineral constituents, oxides of magnesium, phosphorous, calcium, sodium and potassium, vitamin C, carotene, hydroquinone, levoglucosenone, furfural, hexadecanoic acid, ethyl ester, linolenic acid, ethyl ester and d-Mannose[22]. The juice of the plant is an astringent and is applied externally to fresh cuts and wounds. It is also used in the treatment of catarrhal opthalmia, dropsy, hysteria, epilepsy, insanity, chronic diarrhea and dysentery. The plant is a folk remedy for anasarea, calculus, cancer, carbuncles, cough, hypertension, snakebites, stones, gout rheumatic affections, leucoderma, bronchitis, piles, asthma, tumors, and enlargement of the spleen, biliousness, thirst, vomiting, burning sensation, bad taste in the mouth, hallucinations, fatigue, leprosy, scabies, skin diseases, fever, erysipelas, epistaxis, etc. According to the Unani system of medicine, Cynodon plant is bitter and acts as a laxative, brain and heart tonic, aphrodisiac, alexipharmic, emetic, emmenagogue, expectorant, carminative and is useful against grippe in children, and for pains, inflammations, and toothache[21,23]. It has been therapeutically proved to possess antidiabetic[24], antidiarrheal[25], diuretic[26], antimicrobial[27], antiulcer[28], immunomodulatory[29], antiepileptic[30], anti-inflammatory[31], antiarrhythmic[32], antibacterial[33], and chemoprotective34 and hepatoprotective activities[35].

The ethanolic and water extracts of C. dactylon have been reported to possess antioxidant activity[36]. As oxidative stress plays an important role in neurodegenerative disorders including Parkinson's disease[37]; and as the plant has traditionally been used in the treatment of neurodegenerative disorders and also possesses antioxidant activity; it was worthwhile to screen the plant for its anti-cataleptic activity as a mark or indication of its anti-parkinson's effect.

MATERIALS AND METHODS

Animals

Swiss albino mice, of either sex weighing 25-35 g, were obtained from Punjab University, Chandigarh and were housed under standard light/dark cycle, with food and water provided *ad libitum*. The experiments were performed between 09:00-16:00 hrs. The experimental protocols were approved by the Institutional Animal Ethics Committee and conducted according to the guidelines of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), New Delhi, India. The standard animal feed was obtained from Ashirwad Industries, Punjab (India).

Chemicals

Reserpine was procured as a gift sample from Chemical Resources (Panchkula, India).

Procurement of extract

Standardized dry aqueous extract of *Cynodon dactylon* was obtained from Amsar Pvt. Ltd., Indore (M.P.).

Methodology

The method described by Kumar and Kulkarni (2006)[38] was adopted. Animals were randomly allocated into four different groups (n=8 per group). Animals of Group I served as Control and were administered with saline (1 ml/kg, i.p.) as vehicle. Group II animals served as negative control and were administered reserpine (dissolved in few drops of glacial acetic acid and volume was made up with distilled water) at a single dose of 2.5 mg/kg (i.p.). Animals in Group III served as drug treated control [(aqueous extract of C. dactylon (AECD)]. This group was further divided into two groups; Group IIIa and Group IIIb which were administered with 150 mg/kg and 300 mg/kg (i.p.) of AECD, respectively. Group IV consisted of animals which received reserpine followed by drug (AECD). This Group was divided into group IVa and IVb which were administered with single doses of AECD (150mg/kg, i.p. and 300 mg/kg, i.p., respectively) after 30 min of reserpine administration. The cataleptic score was measured 4 hrs after the C. dactylon treatment (groups III and IV) or reserpine administration (group II).

The bar test was used for measuring catalepsy. In the bar test, the cataleptic score was measured by placing both the front paws of the

mouse on a horizontal bar 6 cm above and parallel to the base. The cataleptic score was measured by counting the time in seconds until the mouse brought both the front paws down to the base. The maximum cutoff for bar test was fixed at 180 s.

Statistical analysis

The data was expressed as mean ± SEM and analyzed by one-way analysis of variance (ANOVA) followed by Tukey test. In all the test the criterion for statistical significance was $p<0.05$.

RESULTS

The vehicle treated control group (Group I) showed a cataleptic score of 4.33 ± 1.76 sec. The cataleptic score for the reserpine treated group (Group II) was found to be 180 ± 1.08 sec which was highly significant ($p<0.001$) as compared to the vehicle treated control group.

The AECD alone treated control groups (Group IIIa and Group IIIb) showed no significant differences in the cataleptic scores (4.16 ± 1.70 and 3.83 ± 1.56, respectively) as compared to the vehicle treated control group (Group I); whereas AECD treatment to mice of Groups IVa and IVb significantly ($p<0,001$) reduced the severity of reserpine induced catalepsy in a dose dependent manner at 150 and 300 mg/kg (i.p.) with cataleptic scores of 56.33 ± 3.13 and 18.50 ± 2.69, respectively. (Fig. 1)

DISCUSSION

Parkinson's disease is a neurodegenerative disorder characterized by the selective loss of dopamine (DA) neurons of the substantia nigra pars compacta. The events which trigger and/or mediate the loss of nigral DA neurons however, remain unclear[38]. Current treatment of Parkinson's disease (PD) is based on dopamine replacement therapy, but this leads to long term complications, including dyskinesia. Plants pose an important and a safer alternative to the treatment of neurodegenerative disorders including parkinsonism. The World Health Organization has also recognized the importance of traditional medicine and has created strategies, guidelines and standards for botanical medicines[39].

The present study was done to evaluate the role of *Cynodon dactylon*, a plant traditionally used for parkinson's disease, for its effect against reserpine induced catalepsy. Reserpine-induced catalepsy is a widely accepted animal model of Parkinson's disease[40]. Some authors have demonstrated that reserpine provides a pharmacological model of parkinsonism[41,42,43] by interfering with the storage of catecholamines in intracellular granules, resulting in monoamine depletion (norepinephrine, 5-hydroxytryptamine and dopamine) in nerve terminals[44] and in the induction of hypolocomotion and muscular rigidity. Antipsychotic effects and extrapyramidal symptoms are also produced due to dopamine depletion.

Catalepsy, the failure to correct an externally imposed posture, is a measure of akinesia and is assessed using the bar test[45]. In the present study, reserpine (2.5 mg/kg, i.p.) induced significant catalepsy in rats as evidenced by a significant increase in the time spent on the bar in bar test as compared to the control untreated rats.

Treatment with C. dactylon, a neuroprotectant, dose-dependently reduced the catalepsy in reserpine-treated rats. The protective effect of *Cynodon dactylon* against reserpine induced catalepsy suggests that this plant has influence on aminergic receptor mediated neurotransmission. This is further supported by a research study carried out in 2009 where it was proved that the administration of ethanolic extract of C.dactylon in mice increased the levels of brain catecholamines (including dopamine) and amino acids[21].

C. dactylon has also been proved for its neuroprotective activity against aluminium induced toxicity[46] and also has been proved to inhibit lipid peroxidation in CNS[36,47].

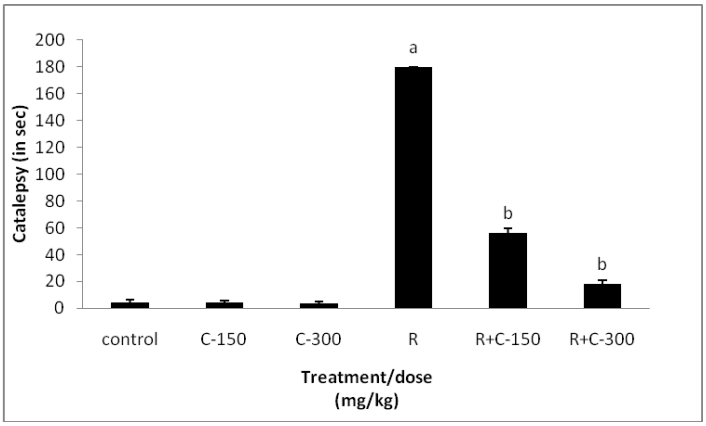

Fig. 1: Effect of C. dactylon on reserpine induced catalepsy

'a' represents significant ($p<0.001$) difference as compared to control group.

'b' represents significant ($p<0.001$) difference as compared to reserpine treated group.

CONCLUSION

The above findings thus suggest that *Cynodon dactylon* may offer a safer therapeutic approach to the treatment of Parkinson's disease. Also C.dactylon being a neuroprotectant, could be used as an effective adjunct to L-dopa for the treatment of neuroleptic-induced extrapyramidal side effects.

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