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ORIGINAL ARTICLE **OPEN ACCESS**

Exploration of Antiparkinsonism Property of Methanolic Extract of *Ocimum basilicum*

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ABSTRACT
The goal of the current investigation was to determine if a methanolic extract of Ocimum basilicum (O.B.) leaves could protect against haloperidol-induced antiparkinsonism. Parkinson's disease (PD) was studied using dosages of 200 mg/kg and 400 mg/kg of methanolic extract of O.B. The extract was administered, which improved locomotion, motor coordination, exploratory behaviors, and decreased depression, anxiety, and catalepsy episodes. The results of this investigation showed that rats treated with a methanol extract of O.B. leaves have neuroprotective potential. Therefore, it can be inferred that Ocimum basilicum may be useful in the treatment of Parkinson's disease.
Keywords: *Ocimum Basilicum, Leaves, PD, Haloperidol, Rat*

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INTRODUCTION

Parkinson's disease (PD) is a difficult neurological condition that affects motor function. It is an extrapyramidal motor condition that includes stiffness, tremor, and hypokinesia, along with possible secondary indications such poor posture, sialorrhea, depression, sleep problems, and dementia [1, 2]. Parkinson's disease (PD) is the second most prevalent neurological disease after Alzheimer's disease (AD) [3]. James Parkinson first described PD in 1817, which primarily affects older adults. Between the ages of 65 and 69, the prevalence of PD is between 0.5% and 1% [4, 5]. In Parkinson's disease (PD), neurons in the nigrostriatal (dopaminergic) tract and substania nigra pars compacta (SN-PC) degenerate. This causes a dopamine shortage in the striatum, which regulates muscle tone and synchronizes movements [6]. Dopaminergic neurons dying in different types of PD have been linked to oxidative stress and neuroinflammation. Lewy bodies, also known as -synuclein protein buildup, are found in the peripheral, autonomic, and central nervous systems. Although the exact cause of PD initiations is uncertain, the majority of researchers point to a confluence of genetic and environmental variables [7]. The dopamine precursor levodopa offers the most clinical relief for Parkinson's disease. Levodopa is typically administered in conjunction with carbidopa. Levodopa's peripheral breakdown is inhibited by carbidopain, which increases the amount of levodopa that may operate on the central nervous system [8]. It has also been proposed that anticholinergic medications have an anti-Parkinsonian effect. The majority of PD patients experience disabling aberrant involuntary movements known as drug-induced dyskinesias as a result of chronic usage of current anti-parkinsonian drugs, including Levodopa therapy. Levodopa's effectiveness decreases over time; thus doctors should administer it less frequently for as long as feasible [9]. Thus, there is a need for novel, more potent pharmaceutically active substances, such as plant extracts, which come from natural sources. Recent investigations have emphasized the potent neuro-protective effects of medicinal plant extracts and phytochemicals in the alleviation of PD symptoms due to their antioxidant and anti-inflammatory characteristics [10]. *Ocimum basilicum* (OB), a member of the Lamiaceae family, is a medicinal plant that is generally referred to as "sweet basil" in English and "tulsi" in Hindi. It is one of the holy plants for Hindus on the Indian subcontinent and grows in tropical and subtropical climates [11]. Traditionally, basil has been used as medicinal plant in the treatment of headache, cough, constipation, diarrhoea, worms, warts, antiemetic, pains, diabetes and kidney malfunction. Major aroma compounds from volatile extracts of basil present anti-oxidative activity [12]. The present study was designed to assess the potential of *Ocimum basilicum* L. methanolic extract (OBME) for the management of PD on the basis of scientific grounds by using a haloperidol-induced PD animal model.

MATERIAL AND METHODS

Collection of Plant Material:

Fresh leaves of *Ocimum basilicum* were obtained from local area in Siruli Mahavir, Puri district, Odisha (Latitude 19º 53' 13.3"N& Longitude 85º 42' 11.9" E). This leaf was authenticated by Mr. Ranjan Jena, Head of Department. of Pharmacognosy, College of pharmaceutical Sciences, Puri, Odisha. Greenish leaves of the plant were washed thoroughly with the help of tap water, and shade dried at room temperature. All dried materials were powdered and sieving under sieve number 10.

Preparation of Methanolic Extraction

The sample was extracted with methanol following a previously reported method with a slight modification [13]. 220 g of the powdered sample was extracted with 1100 ml of methanol for 6-7 h in a Soxhlet apparatus [14]. The extracts were kept in desiccators which allow the solvent is completely evaporated. The extract was filtrated; the yielding is greenish-black sticky residue. Finally, 60.64 g yield of crude drug was collected and kept in freeze.

Phytochemical Screening

There are various phytochemicals are present in the methanolic leaf extracts were screened as per standard protocols for the presence of phytochemical constituents such as glycosides, tannins, phenols, flavonoids.

Thin Layer Chromatographic Analysis

On a glass slide with pre-applied silica gel measuring 20 by 20 cm, TLC was performed. Added 10 l of *Ocimum basilicum* extract to the surface. The extract-loaded plates were maintained in a chromatographic chamber and operated in a 7:3 chloroform: ethanol solvent system (280 ml:120 ml) for 10 to 15 minutes [15]. It was then exposed to iodine vapour once more in a glass beaker filled with iodine crystals. The sample run spot's color changed to indicate the presence of phenols. The ratio of the compound's or solvent's travel distance to the solvent's travel distance over a specified period of time is known as the retention factor (Rf). The sample site was then measured.

Experimental Design

Two healthy albino Wistar rats weighing 150–200 g of either sex was used for *in vivo* anti-Parkinson activity. The rats were acquired and placed in an animal house under proper conditions (12-hour light and dark cycle, room temperature 25°C) in polypropylene cages. The experiments were carried out as per the guideline of CPCSEA, New Delhi, India. Bearing Regd. No. 2235/PO/Re/S/23/CCSEA

Evaluation of Anti-Parkinson Activity: -

Disease induction

In rats, haloperidol (1 mg/kg) was given once daily (intra peritoneally) for twenty-one days to induce Parkinson's disease except the normal control group. It was injected before one hour of extract treatment [16].

Behavioural Analysis

The catalepsy, rotarod test were conducted to investigate the behavioural analysis [16].

Catalepsy Test

Rats with catalepsy have tight muscles and are unable to react to outside stimuli. After receiving haloperidol, the rats were briefly strapped to a wooden bar with their forelimbs elevated by 3–9 cm, and the time it took them to adjust their posture was noted as a catalepsy indicator. When the rats reach the top of the bar or their forelimbs touch the floor, the catalepsy is over. After 30, 60, 90, and 120 minutes, these observations were recorded. All research was conducted in a quiet setting between 23 and 25 degrees Celsius with a 5-minute time limit [17].

The scoring of catalepsy was as follows:

(i) Score 0: when the rats were placed on the table, they moved normally

(ii) Score 0.5: when pushed or touched, the rats behaved normally

(iii) Score 2: in 10 seconds, the rats were unable to correct the imposed posture; 1 score for every paw

Rotarod Test

The rota rod technique employed was comparable to that mentioned by [18]. The roller rod was set to turn at 15 rpm via the speed selector. Each animal received a 1-minute exposure to the moving rod before to the test. Three minutes were spent with the animals on the roller. There was a latency to fall from the rolling rod. A typical animal could stay in balance for an endless amount of time. The animal's failure to stay on the roller for the whole three minutes of testing was a sign of movement impairment.

RESULT AND ISCUSSION

Phytochemical Analysis

The results of the preliminary phytochemical screening of methanolic leaf extracts of *Ocimum basilicum* as summarized in Table 1 revealed the presence of phenols, flavonoids, tannins and saponins.

Table 1: Phytochemical screening of methanolic leaf extracts of *Ocimum Basilicum*

Substances	Test	Results
Flavonoids	Lead acetate solution Test	+
Tannins	Ferric chloride Test	+
Glycosides	Keller Killiani Test	-
Phenolics	Ferric chloride Test	+

Thin Layer chromatographic analysis

TLC developed in the mobile phase of chloroform: methanol for methanolic extracts of *O. basilicum* with gallic acid as the reference compound showed R_f values of 0.68, compared to the gallic acid standard of 0.7, after exposure to iodine vapour stated that gallic acid showed varying Rf values in different solvent systems.

Behavioural Analysis

Rota rod test

In the group, which received only haloperidol, a significant decrease in retention time ($p<0.001$) was seen on day "0" and day "07" when compared to the control group. In levodopa treated group, a significant increase in retention time ($p <0.001$) was seen on the day "0" and the day "07" when compared to haloperidol treated group. However, unlike levodopa treated group, *Ocimum basilicum* 200 mg/kg and 400 mg/kg pretreated groups did not cause any significant change in retention time on the day "0". However, on day "07" *Ocimum basilicum* 200 mg/kg and 400 mg/kg groups showed significant increase in retention time ($p<0.001$) when compared to haloperidol treated group as shown in Figure 1 whereas, 400mg/kg is more effective than 200 mg/kg. The retention time for Control (CTRL), Haloperidol (HPDL), 200 mg/kg O.B and 400 mg/kg O.B were found to be 35.2 ± 2.04, 12.7 ± 1.87, 31 ± 2.82 , and 32.7 ± 3.01 respectively (Figure 1).

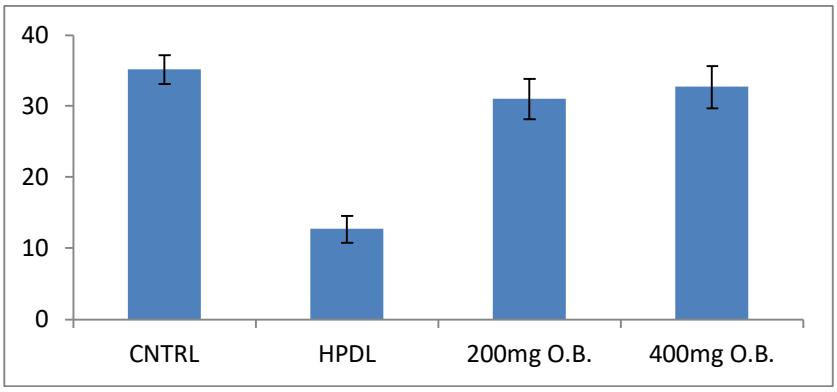

Figure 1: Bar graph for the dose study of rotarod

Catalepsy test

In the group which received only haloperidol, significant increase in latency period ($p<0.001$) was seen on day "0" and the day "07" as compared to the control group. In levodopa treated group, a significant decrease in the latency period ($p<0.001$) on day "0" and the day "07" was seen as compared to haloperidol treated group. However, unlike levodopa treated group, *Ocimum basilicum* 200 mg/kg and 400 mg/kg pretreated groups did not cause any significant change in the latency period on the day "0." However, on day "07" *Ocimum basilicum* 200 mg/kg and 400 mg/kg groups showed significant decrease in latency period ($p<0.001$) when compared to haloperidol treated group whereas, 400mg/kg is more effective than 200 mg/kg. The latency period for Control (CTRL), Haloperidol (HPDL), 200 mg/kg O.B and 400 mg/kg O.B were found to be 0.25 ± 0.41, 3.0 ± 0.44, 0.25 ± 0.27, and 0.58 ± 0.37 respectively (Figure 2).

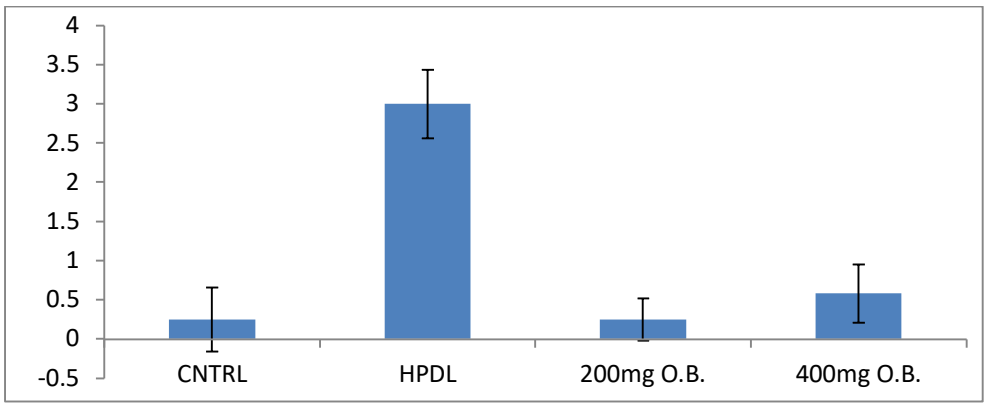

Figure 2: Bar graph for the dose study of Catalepsy

DISCUSSION

Parkinson's disease (PD) is a difficult neurological condition that affects motor function. This extrapyramidal motor condition is characterized by rigidity, tremor, and hypokinesia, and it may also include secondary signs like poor posture, sialorrhea, depression, sleep problems, and dementia. There are many side effects of the currently available anti-Parkinson drugs, so the current approaches for treatment focuses on newer agents that will either inhibit or terminate the progression of the ailment and be economical. Therefore, current research of plant extract of *Ocimum basilicum* offers effective result than other drugs. In order to compare the neuroprotective effect of our methanolic extract with current practices and medications being used conventionally, this study was conducted to evaluate the neuro protective potential of the methanolic extract of *Ocimum basilicum*. The standard drug that was used throughout the study was haloperidol. It was discovered that catalepsy, a crucial biomarker for assessing Parkinson's disease, had improved. The extract was administered, which improved locomotion, motor coordination, exploratory behaviors, and decreased depression, anxiety, and catalepsy episodes. Increased oxidative stress in the body and an imbalance in antioxidant enzymes have been linked to the emergence of neurodegenerative illnesses, according to a number of earlier research.

CONCLUSION

This study looked into the *Ocimum basilicum's* medicinal potential for Parkinson's illness. *Ocimum basilicum's* antioxidant potential was assessed by behavioral experiments, and its anti-Parkinson's action was verified. It has been discovered to alleviate behavioral and motor function deficits in a rat model of PD caused by haloperidol. It has been noted that antioxidant enzymes can be restored and oxidative stress can be decreased in this condition. Therefore, it can be inferred that *Ocimum basilicum* may be useful in the treatment of Parkinson's disease.

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