



NEUROPROTECTIVE ROLE OF *COSTUS IGNEUS* IN PARKINSON INDUCED *D. MELANOGASTER*

Biochemistry

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ABSTRACT

Drosophila melanogaster is introduced to the diseased state of Parkinson's by mitochondrial complex I inhibitor rotenone. Neuroprotective function of *Costus igneus* was put to test in these Parkinson induced *D. melanogaster*s. 4 groups each- healthy control, diseased control, positive control & study drug group formed the backbone of this study. Climbing assay and oxidative stress indicator malondialdehyde were the reference barometers in this study.

KEYWORDS

Parkinson's disease, *Drosophila Melanogaster*, *Costus Igneus*

INTRODUCTION:

Neurodegenerative diseases are caused by progressive loss of specific neurons and are mostly age-related human diseases. People developing neurodegeneration are usually asymptomatic during the development of disease. Parkinson's disease is second most common neurodegenerative disorder which occurs due to the loss of specific neurons i.e., dopaminergic neurons of substantia nigra pars compacta and striatum resulting motor/ movement disability. The identification of mutations associated with familial disease as well as effect of environmental toxins lead to the development of many in vivo and in vitro models. As the susceptibility of dopamine producing neurons to environmental toxins is conserved between humans and *Drosophila melanogaster*, it is one of the animal models which has been used extensively for the study of Parkinson's disease^[1,2].



1.1. *Drosophila Melanogaster*^[9]

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Family: Drosophilidae
Genus: *Drosophila*
Species: *Melanogaster*

Drosophila melanogaster is a Dipteran (having one pair of wings and one reduced pair for balancing). Diversification from mosquito occurred millions of years ago. 4 pairs of chromosomes are a characteristic of *D. melanogaster*. With life span ranging from 50-60 days, it varies from strain to strain.

Canton S strain is the employed strain in our work because of its low mutation rate. It has a life span of around 60 days. Primarily used for genetic studies, now also applied in neurodegenerative diseases, alcohol withdrawal studies, cancer studies, drug abuse studies, oxidative stress and ageing, and many more. 75% of known human disease genes have a recognizable match in genome of fruit fly. 50% of fly protein sequences have human homologs.



1.3 *Costus igneus*^[7]

Botanical name- *Costus igneus*
Domain- Eukaryota
Kingdom- Plantae
Phylum- Tracheophyta
Subphylum- Euphyllophytina
Infraphylum- Radiotopses
Class- Liliopsida
Subclass- Commelinidae
Superorder- Zingiberales
Order- Zingiberales
Family- Costaceae
Subfamily- Asteroideae
Genus *Costus*
Specific epithet- *igneus*

Costus igneus belongs to the family Costaceae, commonly known as insulin plant in India because its leaves help to build up insulin in the human body. Insulin plant is one such traditional plant which is getting global acceptance nowadays and is now widely used as an ayurvedic medicinal herb. Insulin plant is native to Southeast Asia, especially on the Greater Sunda Islands in Indonesia. It is relatively a new entrant to India and is being grown as an ornamental plant in Kerala.^[6]

Ethanolic extract of Costus igneus was able to produce a significant effect on learning and memory in diabetic rats.^[6]

METHODS:

2.1. CLIMBING ASSAY

The *Drosophila* adult brain has been characterized to contain clusters of dopaminergic neurons. Chronic exposure to Rotenone, a mitochondrial complex I inhibitor, results in the development of characters present in sporadic Parkinson's disease. It results in neurodegeneration and motor deficits due to selective loss of dopaminergic neuron loss in all the brain clusters. Motor deficits in *Drosophila* is assessed by their ability to climb or fly negatively geotactic to a pre-set height^[2,3].

2.2 *Drosophila* Grouping:

30 flies per group	Described media	Rotenone	L-Dopa	Study drug
Healthy control	+	-	-	-
Diseased Control	+	+	-	-
Positive Control	+	+	+	-
Study Group	+	+	-	+

2.3. Estimation Of Malondialdehyde By Ohkawa Et Al Method^[8]:

Malondialdehyde is an inflammatory marker. Rotenone causes oxidative stress and a minute oxidative stress causes rise in levels of

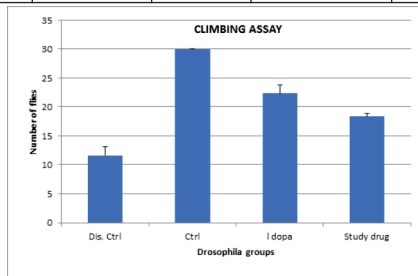
malondialdehyde. The drug prepared is expected to reduce the oxidative stress. And that in turn will reduce the loss of neurons.

OBSERVATIONS AND RESULTS:

3.1: CLIMBING ASSAY

3.1.1 Mean and Standard Deviations:

Parameter	Disease Control	Healthy Control	L-Dopa	Study Drug
Mean $\pm$ SD	11.66 $\pm$ 1.52	30 $\pm$ 0	22.33 $\pm$ 1.52	18.33 $\pm$ 0.57

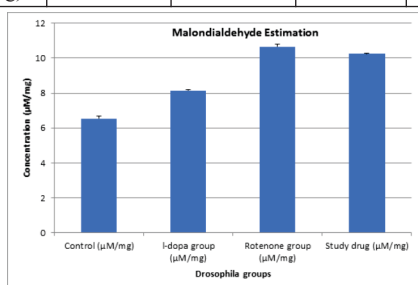


Error bar is an indication of standard deviation.

3.2: MDA ASSAY

3.2.1 Mean and Standard Deviations:

Parameter	Disease Control	Healthy Control	L-Dopa	Study Drug
Mean $\pm$ SD (μ M/mg)	10.66 $\pm$ 0.15	6.53 $\pm$ 0.14	8.15 $\pm$ 0.05	10.24 $\pm$ 0.04



Error bar is an indication of standard deviation.

DISCUSSION:

Canton S strain of *D. melanogaster* was employed as a model organism in this study. 4 groups having 30 flies in triplets were used in this experimental work-healthy control, diseased control, positive control & study drug. Climbing assay and oxidative stress parameter malondialdehyde were determining forces in the nature of this work.

CONCLUSION:

Our findings provide resourceful documentation in the neuroprotective role of *C. igneus*. No of files crossing over median line in 45 seconds increased slightly in the study drug group. Malondialdehyde assay results prove claim that oxidative stress was reduced which is indicative of reduced neural damage.

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