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EFFECT OF EXTRACT OF RUDRAKSHA (ELAEOCARPUS GANITRUS) ON PARKINSON'S DISEASE AND DEPRESSION

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ABSTRACT

Parkinson's disease is a major cause of disability among the elderly. Parkinson's disease is currently the second most common neurological degenerative disorder after Alzheimer's disease, affecting an estimated 1.5% of the US population over the age of 65, and more than 4 million individuals over the age of 50 worldwide, a number expected to double by the year 2030. Parkinson's disease is more common in males and is twice as likely to affect whites and Hispanics as blacks and Asians.[1] Depression is the common cold of mental disorders — most people will be affected by depression in their lives either directly or indirectly, through a friend or family member. Confusion about depression is commonplace, e.g., with regard to what depression exactly is and what makes it different from just feeling down. There is also confusion surrounding the many types of depression that people experience — unipolar depression, biological depression, manicdepression, seasonal affective disorder, dysthymia, etc.[2] Elaeocarpus ganitrus commonly known as Rudraksha in India belongs to the Elaeocarpaceae family and grows in the Himalayan region. Type Elaeocarpus has about 360 species, occurs during Australia, East Asia, Malaysia and the Pacific Islands. About 120 species belonging to this genus from different parts of Asia and out of this, 25 species occur in India alone.[3] Present text has been attempting to give an idea about the curing property for parkinson's disease and depression of Rudraksha (Elaeocarpus ganitrus).

KEYWORDS: Elaeocarpus ganitrus, depression.

INTRODUCTION

Elaeocarpus ganitrus (syn: Elaeocarpus sphaericus; Elaeocarpaceae) is a large evergreen big-leaved tree. Elaeocarpus ganitrus is a medium sized tree occurring in Nepal, Bihar, Bengal, Assam, Madhya Pradesh and Bombay, and cultivated as an ornamental tree in various parts

of India. The Elaeocarpus ganitrus is an inhabitant shrub that has a good rich history of traditional uses in medicines.[3]

Plant Profile

Elaeocarpus ganitrus wild Taxonomy- Elaeocarpus ganitrus falls under the classification of scientific as follows:

Scientific Classification Botanical Name- Elaeocarpus Ganitrus (Roxb.)

Kingdom- Plantae

Division- Magnoliophyta

Class- Magnoliopsida

Order- Oxalidales

Family- Elaeocarpaceae

Genus- Elaeocarpus

Species- E. Ganitrus

Common Name- Rudraksha Type- E. Serratus Linn, E. Ganitrus Roxb, etc.

Habit- Tree.[4]

Morphological & Macroscopical Description

The morphological characters of plant are shown below as follow as, and macroscopically description given in the table 1 and 2.

Leaves- Simple, glabrous, oblong-lanceolate, sub-entire or irregularly crenate, acute or acuminate

Flower- White or yellow colored, in dense racemes and mostly from axils of fallen leaves, fringed petals, anthers are linear, appear in April-may

Fruits- Round or oval, small, violet or blue colored and acidic in taste Endocarp- Stony endocarp is hard, globular, strongly tubercule, marked with 5 to longitudinal ridges, rarely 1 to 4, reddish brown in color.[5][6][7][8]

Table 1: Macroscopically Examination of leaf.[8]

S. No	Leaf	Inspection/Observation
1	Apex	Acute
2	Base	Symmetric
3	Color	Shining green
4	Margin	Undulate
5	Shape	Ovate
6	Size	5-6 INCH LENGTH, 2 INCH BROAD

Chemical constituent of E. ganitrus

Active constituents

Active constituents present in Rudraksha are elaeocarpidine, elaeocarpine, rudrakine, flavonoids quercetin (Johns SR., et al., 1971, Ray AB., et al., 1979, Chand L., et al., 1977). Extracts shows presence of phytosterols, fat, alkaloids, flavonoids, carbohydrates, ethanol, proteins and tannins, gallic acid and ellagic acid. It contains 50.03% C, 0.95% N, 17.89% H, and 30.53% O2. Phytochemical investigation with different extracts shows different kind of chemicals. extraction with petroleum ether shows presence of fixed oil fats and phytosterols. Extraction with ethanol ether shows presence of alkaloids, flavonoids, carbohydrates, proteins, tannins. Extraction with water shows presence of, carbohydrates, proteins, tannins. Elaeocarpus sphaericus yields mainly indolizidine alkaloids. Alkaloids including isoelaeocarpine, epiisoelaeocarpiline, epielaeocarpiline, alloelaeocarpiline and pseudoepiisoelaeocarpilline.[9]

Pharmacological Activities

Antioxidant properties

Elaeocarpus ganitrus are reported to possess promising antioxidant capacity. Phytochemical analysis has revealed that different extracts contain constituents like flavonoids, polyphenols, biflavones, tanins and phenolic compounds etc. Experiments have shown that etanolic extract (EE) is found to have 24.18 mg ascorbic acid equivalents at 500 µg/ml extract concentration proving antioxidant activity of extracts.

Fig. 01: Elaeocarpus ganitrus.

Reducing power of a compound also reflects its potential of antioxidant capacity Reducing power of tannins prevents liver injury by inhibiting the formation of lipid peroxides. Reducing power of EE ranged from 1.112 to 1.973 concentrations.

Metal chelating agents reduce the concentration of catalyzing transition metal in lipid peroxidation by forming sigma bonds with metals, reducing redox potential thereby

stabilizing the oxidized form of the metal ion. There is a positive relationship with antioxidant properties and concentrations of flavonoids & polyphenols. Maximum the quantity of flavonoids and polyphenols maximum the antioxidant capacity. Total phenolic compounds of E.ganitrus are 56.79 mg gallic acid equivalent/g of dry material. Total flavonoids present are 18.58 mg equivalent/g of dry material. (Kumar ST., et al., 2008).[10]

Antifungal activity

Different extracts of dried Rudraksha beads [petroleum ether extract (PE), chloroform extract (CE), ethanol extract (EE) and water extract (WE)] have shown different Minimum Inhibitory Concentrations (MIC) for different strain of fungi like Candida albicans, Candida tropicallis and Aspergilus niger. MIC for CE was found to be 1.5 mg/ml followed for EE i.e. 4.0 mg/ml for C. albicans. MIC for CE was 5.0 mg/ml when investigated for C. tropicallis. C. tropicallis did not show any sensitivity against WE and EE. MIC of CE and EE for A. niger was 3.0 mg/ml followed by WE (MIC 5.0 mg.ml) and no inhibition was shown for C.glabrata and G.candidum even at higher concentrations.

Antibacterial activities

Extracts of fruits of Elaeocarpus sphaericus in petroleum ether (PE), benzene (BE), chloroform (CE), acetone (AE), and ethanol (EE) were tested for its bactericidal properties. Several bacterial strains (Staphylococcus aureus, Enterococcus faecalis, Bacillus subtilis, Salmonella typhi and paratyphi, Salmonella typhimurium, Vibro cholera, Aeromonas hydrophila, Shigella sp., Klebsilla pneumonia, Enterobacter sp. And Pseudomonas sp. etc.) were found to be sensitive to the exposure of these extracts (Singh RK and Nath G, 1999).[11]

Anxiolytic effects

Shah Gagan et al., 2010, have investigated the anxiolytic effect of methanolic extract (ME) of Rudraksha fruit by Elevated plusmaze (EPM) assay and found that magnitude of the anxiolytic effects of 200mg/kg of ME of Rudraksha fruit was close to that observed with 0.5 mg/Kg of diazepam. ME prolonged the ketamine-induced latency to sleep. ME was also found to affect locomoter activities. Thus these results support the traditional use of plant in management of anxiety. (Shah G. et al., 2010).[12]

Anticancer agent

Chloroform soluble extract from bark of Elaeopcarpus mastersil from Malaysia has shown significant cytotoxic activity against human cancerous cell lines (human oral epidermoid

carcinoma cell line). Phytochemical analysis revealed the presence of ellagic acid and curarbitacin from bark which have shown an effective cytotoxicity against tumour cells (Ito A. et al., 2002).[13]

Antihypertensive agents

Aqueous extract of seeds of Elaeocarpus ganitrus have decreased the mean arterial blood pressure at the dose level of 25, 50 and 100 mg/kg in models Male Wister rat and Swiss albino mice. The activity may be due to the action on rennin angotensin system. (Sakat SS et al., 2009).[14]

Antidiabetic activity

Extract of plant has been shown to have anti hyperglycemic activity in a dose dependent manner. STZ (Streptozotocin) induced hyperglycemia in rats was shown to be reduced by the extract but was not able to restore the blood glucose level to the baseline value. The results were given so as to use the plant extract with alternative for diabetic control. (Hule & Juvekar et al, 2011).[15]

Anti-asthmatic activity

Different extracts of E. sphaericus fruit (PE, BE, CE, AE and EE) are reported to have protective role in bronchial asthma. In vitro experiments have shown that fruit extracts have rat mesenteric mast cells stabilizing activities (Singh RK, et al., 2000).[16]

Anti-inflammatory and Analgesic activities

Jaspreet Nain and group (Jaspreet N. et al., 2012) have investigated the analgesic and antiinflammatory properties of different extracts of E. sphaericus leaves by carrageenan-induced paw oedema in rats and tail flick tests in mice. Methanolic and aquous extracts have shown promising anti-inflammatory activities at the doses of 50, 100 and 200mg/kg. Diclofenac sodium at an concentration of 5mg/kg was used as positive control. Some studies have also reported the cardioprotective (Sarkar PK et al., 1972 and 1973) and nootropic (increasing learning and memory) activities of methanolic extract of E. ganitrus in animal models.[17]

In vitro antifungal activity of all the extracts was carried out using the disk-diffusion assay[18] and broth dilution test.[19,20] The disk-diffusion assay was applied to determine the growth inhibition of fungi by extracts to be tested. Overnight fungal cultures (100 µl) were spread

onto SDA. The extracts were applied to 8 mm disks (Whatman paper No.1). After 48 h of incubation at 25°, the diameter of growth inhibition zones was measured. MIC of all extractives was determined by broth dilution test which was performed in test tubes. The conidial suspension, which gave the final concentration of 1×10^5 CFU/ml, was prepared. A growth control tube and a sterility control tube were used in each test. After 24-72 h incubation at 25°, the MIC was determined visually as the lowest concentration that inhibits growth, evidenced by the absence of turbidity on the fungal strains, *Asperagillus niger* (MTCC-281), *Candidum geotrichum* (MTCC-3993), *Candida albicans* (MTCC-227), *C. glabrata* (MTCC-1637) and *C. tropicalis* (MTCC-230) using ketoconazole as the positive control. Minimum inhibitory concentration (MIC) is the concentration required to inhibit fungal cell proliferation by 50% after exposure of cells to test compounds. Inhibitory concentration in terms of MIC (mg/ml) was determined using turbidimetry method (Table 2). Maximum inhibition was observed for CE (MIC 1.5 mg/ml), followed by EE (MIC 4.0 mg/ml) on *C. albicans*. In the case of *C. tropicallis* maximum inhibition of MIC 5.0 mg/ml was observed for CE, whereas, no inhibition was observed for EE and WE. Maximum inhibition of MIC 3.0 mg/ml on *A. niger* was observed for CE and EE, which is followed by WE (MIC 5.0 mg/ml). It is also pertinent to mention here that various plant extracts showed no sign of inhibition on *C. glabrata* and *G. candidum* even at higher concentration.

Table 2: *In Vitro* Activity of *E. Ganitrus* on Various Fungal Strains.

Strains	Extractives	Dilutions (mg/ml)								
		0.125	0.5	1.0	1.5	2.0	3.0	4.0	5.0	Ketocon-azole
C. albicans	CE	+++	++	+	-	-	-	-	-	-
MTCC 3017	EE	+++	+++	+++	+++	++	+	-	-	-
	WE	+++	+++	+++	+++	+++	+++	+++	+++	-
C. tropicallis	CE	+++	+++	+++	+++	+++	++	+	-	-
MTCC 230	EE	+++	+++	+++	+++	+++	+++	+++	+++	-
	WE	+++	+++	+++	+++	+++	+++	+++	+++	-
C. glabrata	CE	+++	+++	+++	+++	+++	+++	+++	+++	-
MTCC 1637	EE	+++	+++	+++	+++	+++	+++	+++	+++	-
	WE	+++	+++	+++	+++	+++	+++	+++	+++	-
C. geotricum	CE	+++	+++	+++	+++	+++	+++	+++	+++	-
MTCC 3993	EE	+++	+++	+++	+++	+++	+++	+++	+++	-
	WE	+++	+++	+++	+++	+++	+++	+++	+++	-
A. niger	CE	+++	+++	++	++	+	-	-	-	-
MTCC 1344	EE	+++	+++	++	++	+	-	-	-	-

Strains	Extractives	Dilutions (mg/ml)								
		0.125	0.5	1.0	1.5	2.0	3.0	4.0	5.0	Ketocon-azole
	WE	+++	+++	+++	++	++	+	+	-	-

*+++ Highly turbid, ++ moderately turbid, + weakly turbid and - No turbidity. The microorganisms tested were, *Candida albicans, C. tropicalis, Candida glabrata, Candidum geotrichum* and *Asperagillus niger.*[21]

Method of extraction

The dried powdered seeds of E. ganitrus were kept for maceration with distilled water for 24 h. Extracts was filtered through vacuum filter and the filtrate was concentrated in vacuum evaporator. Dried extract.

Effects of the active constituent of body

Quercetin (QC) is a polyphenolic compound found in rudraksha i.e. E.ganitrus. Previous studies have demonstrated that quercetin contains many good biological properties for human health including antioxidant[22], anti-inflammation[23], and anticancer[24] activities. Recently, it has been reported that quercetin can pass through the blood-brain barrier of in situ models.[25] In addition, quercetin exerts the protective effect in a stroke model induced by transient global ischemia.[26] Quercetin significantly protected the neuronal cells from the oxidative stress-induced neurodegeneration in Alzheimer's disease[27], decreased lipid peroxidation, improved the activity of catalase and superoxide dismutase[28] and also prevented glutathione depletion.[29] Previous study showed that the EGb761, a standardized extract from the herbal medicine Ginkgo biloba, contains a high amount of quercetin and exhibits the neuroprotective effect against oxidative damage induced by 6-OHDA.[30] Moreover, it was found that quercetin attenuated the neuronal death in the hippocampus resulting in improved learning and memory in arm maze test.[31] Therefore, these pieces of evidence point out the possibility that quercetin might exert an influence on the central nervous system.

Discussion towards the treatment for Parkinson's disease and depression

Based on the antioxidant and anti-inflammatory actions of quercetin, I hypothesized that quercetin can be used with the levodopa (drug used in parkinson's disease) can be effective in Parkinson's disease.

As it is proved that treatment with quercetin for two weeks before and after a 6-OHDA injection can improve performance in the Morris water maze test of the rats. So quercetin has cognitive enhancing effect for PD.

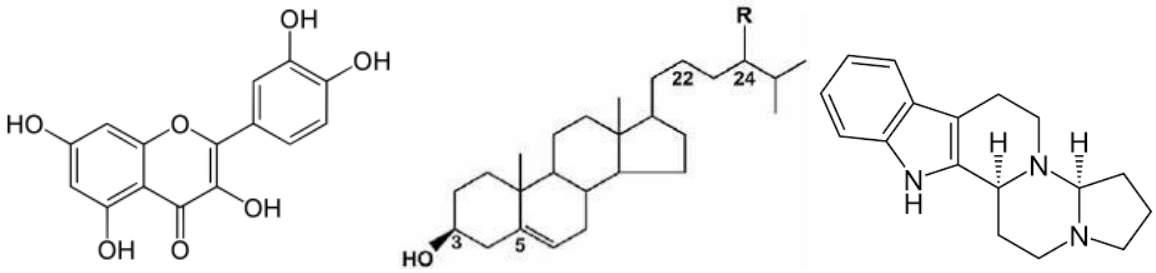
The antihypertensive activity of aqueous extract of E. ganitrus may be resulted through the action on rennin-angiotensin system. So due to the antihypertensive activity of above extract can be used to treat depression effectively.

As the Elaeocarpus ganitrus can come under alkaloids, tannins (as it is yielding gallic and ellagic acid) it can be used as the nerve tonic too.

RESULT

The aqueous extract of E. ganitrus consisting of quercetin, phytosterols, rudrakine and elaeocarpidine due to its antioxidant, anti-inflammatory and antihypertensive activity can be used in the treatment for parkinson's disease and depression.

The below are the structure of quercetin, phytosterol and eleaocarpidine respectively.



CONCLUSION

It was concluded that quercetin exerts the cognitive enhancing effect in this PD model via its antioxidant effect resulting in the promotion of neuron survival. Consequently, the use of quercetin as an adjuvant therapeutic agent for the treatment of cognitive impairment in PD should be considered. And due to the antihypertensive property of E. ganitrus can be used in treatment of depression. However, further investigations are still required.

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