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ANTI EPILEPTIC ACTIVITY OF *OCIMUM SPECIES*: A BRIEF REVIEW

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Abstract

The *Ocimum* species is a medicinal herb used in the indigenous system of medicine. *Ocimum sp.* have variety of biological, pharmacological properties such as antibacterial, antiviral, antifungal, antimalarial, anthelmintic, antidiarrhoeal, antiinflammatory, antihypertensive, cardioprotective, central nervous system (CNS) depressant, antidiabetic, antithyroidic, antioxidant, anticancer, chemopreventive, radioprotective, immunomodulatory, antifertility, antiulcer, antiarthritic, antistress, antileucoderma and anticoagulant activities. Several species of *Ocimum* are used to cure central nervous system (CNS) disorders in various part of the world due to its anticonvulsant property. Epilepsy is a chronic disorder which is characterized by seizures. Seizures are resistant to treatment with currently available anticonvulsant drug (AEDs) in about one out of three patient with epilepsy. This review refers to the study of *ocimum* as an antiepileptic drug (AEDs) because of its specific anticonvulsant property.

Key words: *Ocimum*, Epilepsy, anti-epileptic activity, central nervous system.

Introduction

Epilepsy is a disease that affects about 40 million people worldwide (Njamnshi et al., 2010). Epilepsy is a condition, which causes seizures to occur. It is one of the most common chronic diseases affecting human beings (Muralidharan et al., 2009). Epilepsy is a chronic disorder of the brain that causes a tendency to have recurrent seizures. Two or more seizures must occur before a person can receive the diagnosis of epilepsy, also known as a seizure disorder. It's not uncommon for children to have a single seizure especially associated with a high fever and an estimated one in 10 people will experience a seizure at some time in life.

The medicinal plants are widely used by the traditional medicinal practitioners for curing various diseases in their day to day practice. From time immemorial, plants have been used for their healing and therapeutic abilities, thus healing action. The aim of the present study was to highlight the anti-epileptic activity of some medicinally important plants like *Withaniasomnifera* (*amhar*), *Ocimum sanctum*, *Brahmighrihta* (*bacopa*), *Catharanthusroseus*, *Caesalpinia crista*, *Citrus sinensis*, *Daturastramonium*, *Ricinuscommunis*, *Terminaliaglaucescens*, *Tetrapleuratetraptera*, *Sennasinguena*, *Jatropha gossypifolia*, *Mentha cardifolia*. The role of such plants, with specific properties of their parts has been demonstrated and proved in earlier studies (Hasan et al., 2012). In traditional system of medicine, different parts

(leaves, stem, flower, root, seeds and even whole plant) of *Ocimum sanctum* Linn. have been recommended for the treatment of bronchitis, malaria, diarrhea, dysentery, skin disease, arthritis, eye diseases, insect bites and so on. The *O. sanctum* L. has also been suggested to possess antifertility, anticancer, antidiabetic, antifungal, antimicrobial, cardioprotective, analgesic, antispasmodic and adaptogenic actions. Eugenol (1-hydroxy-2-methoxy-4-allylbenzene), the active constituents present in *O. sanctum* L. have been found to be largely responsible for the therapeutic potentials. The pharmacological studies reported in the present review confirm the therapeutic value of *O. sanctum* L. (Pattanayak et al., 2012) This paper reviews the potential of *ocimum* species that can be explored to ascertain anti-epileptic activity.

Types of epileptic seizure

Generally two types of Seizures were observed 1) Generalized Seizures, 2) Partial Seizure. The generalized seizures are characterized as a) Tonic Clonic (Tonic rigidity of extremities, massive Clonic jerking, onset at any age) b) Simple Absence (Sudden loss of consciousness up to 30 sec Clonic jerking of eyelids) c) Myclonic jerking (Sudden Violent contraction of extremities, onset 5-20 years) and d) Atonic/Akinetic (Atonic/Akinetic sudden loss of muscle tone lasting 10-60sec, onset 1-5 years) and Partial Seizure are characterized into two a) Simple Seizure (Simple Seizure Convulsant confined to single limb or muscle) b) Complex Seizure (Complex Seizure

Confused behavior, loss of consciousness, last for several minutes.).

Anti-epileptic activity of *ocimum* sp.

Several *Ocimum* species (Lamiaceae) are used to treat central nervous system (CNS) disorders in various parts of the world and its depressive activity is frequently reported (Corrêa, 1984). Leaves from *Ocimum* species release a pleasing odor when squashed between the fingers and could be used as a culinary condiment (Mäkinen et al., 1999) and for insect control (Holm et al., 1999) published data from ethnopharmacological sources indicate the use of *Ocimum basilicum* as a sedative in Spain (Vázquez et al., 1997) and as a sedative and anticonvulsant in Mexico (Tortoriello et al., 1992). Brazilian Tropical Atlantic Forest inhabitants use a decoction of *Ocimum gratissimum* L. roots as a sedative for children (Di Stasi et al., 2002). Sedative and anticonvulsant activities were experimentally detected from *Ocimum tenuiflorum* (*Ocimum sanctum*) (Jaggi et al., 2003; Pérez de Alejo et al., 1996; Sakina et al., 1990). Chemical composition of essential oil from *Ocimum* species varies in different chemotypes have been reported for *Ocimum basilicum* (Grayer et al., 1996). Two morphological varieties of *Ocimum gratissimum* were found based on volatile oil constituents into six groups, which were aggregated into three chemotypes (eugenol, thymol and geraniol) according to genetic markers and volatile oil constituents (Vieira et al., 2001). In the present study with *Ocimum gratissimum* the major component is eugenol, followed by 1,8-cineole, which is present in very low amount in accessions studied by Vieira et al. (2001). Experimental studies showed that eugenol has anesthetic, hypothermic and anticonvulsant properties (Dallmeier et al., 1981). It is known that climatic conditions and water available in the soil can change the vegetal secondary metabolism and, consequently, alter the composition of essential oils, throughout the seasons of the year. Chemical variations in essential oils were associated with seasons for *Ocimum selloi* (Moraes et al., 2002) and with time of day for *Ocimum gratissimum* (Vasconcelos Silva et al., 1999). The essential oils obtained in each season were capable of increasing the barbiturate-induced sleeping (a barbiturate drug, usually pentobarbital or thiopental are used to protect the brain during major neurosurgery) duration. The greatest effect was obtained with the preparation from autumn, and the least effect was observed with that from winter, which was not active in the lesser dose administered (Marques et al., 2006). Govind P. et al., presented a review on pharmacological activities of *ocimum sanctum* (tulsi). *Ocimum sanctum* Linn. is medicinal herb used in the indigenous system of medicine. OS has a variety of biological pharmacological activities such as antibacterial, antiviral, antifungal, antimalarial, anthelmintic, antidiarrhoeal, analgesic, antipyretic,

antiinflammatory, antiallergic, antihypertensive, cardioprotective, central nervous system (CNS) depressant, memory enhancer, antihypercholesterolaemic, hepatoprotective, antidiabetic, antiasthmatic, antithyroidic, antioxidant, anticancer, chemopreventive, radioprotective, immunomodulatory, antifertility, antiulcer, antiarthritic, adaptogenic / antistress, anticonvulsant, antileucodermal and anticoagulant activities (Govind et al., 2010). Anticonvulsant and anxiolytic activities of leaf extracts and fraction of *Ocimum gratissimum* L. (Lamiaceae) were studied using seizures induced by pentylenetetrazol and open-field tests in mice. The results showed that the extracts and fraction increased the latency of tonic and tonic-clonic seizures and death and elicited 50% protection against mortality. In the open-field test, the extracts and fraction decreased the frequency of line crossing, center square entries, rearing against a wall and grooming, whereas grooming duration and freezing frequency and duration were increased. Acute toxicity test in mice gave an oral LD₅₀ greater than 5000 mg/kg for the methanol extract (Okoliet al., 2010).

Current scenario and Future prospective of epilepsy

In India studies have reported the prevalence rate of epilepsy varying from 1720 to 9800 cases per million populations. The anticonvulsant activity of furanocoumarins, coumarin mixture and the essential oil obtained from the fruits of *Heracleum crenatifolium* was examined against maximal electroshock (MES)-induced seizures in mice. Bergapten showed significant anticonvulsant activity. Despite the optimal use of available antiepileptic drugs (AEDs), many patients with epilepsy fail to experience seizure control and others do so only at expense of significant toxic side effect. This review describes new herbal anticonvulsant agents representing various structures for which the precise mechanism of action is still not known. Here we are providing the review of herbal anticonvulsant agents, which seem to be effective when evaluated for their anticonvulsant activity (Nikalje et al., 2013). Dementia is one of the age related mental problems and a characteristic symptom of various neurodegenerative disorders including Alzheimer's disease. Certain drugs like diazepam, barbiturates and alcohol disrupt learning and memory in animals and man. However, a new class of drugs known as nootropic agents is now used in situations where there is organic disorder in learning abilities (Joshi et al., 2006).

The results of the above studies support the use of this plant for human and animal disease therapy and reinforce the importance of the ethno-botanical approach as a potential source of bioactive substance (Pattanayak et al., 2010). Thus, the aim of the present study was to investigate whether seasonal variations in composition of essential oil of *Ocimum gratissimum* are accompanied by changes in pharmacological properties, using experimental

procedures to investigate the central nervous system activity (Marques et al., 2006).

U.S. and England studies shows up to 1 in 3 persons uses antiepileptic drugs. Herbs taken include ginseng, St. John's wort, melatonin, ginkgo biloba, garlic and black cohosh to treat seizures (<10%), other symptoms (20%), and general health (>70%). Currently available antiepileptic drugs (AEDs) provides adequate seizure control in many patient; still about 28-30% of patient are estimated to be poorly treated. Several newer drugs (such as pregabalin, stiripentol, lamotrigine, zonisamide, topiramate) as promising anticonvulsants. These drugs have proven to be effective in reducing seizure, whilst their therapeutic efficacy is overcome by some undesirable side effect such as headache, nausea, hepatotoxicity, anorexia ataxia, drowsiness, gastrointestinal disturbance and hirsutism. These observations affirm the further scope and need for the development of newer agent. The term "convulsion" is often used interchangeably with "seizure," although there are many types of seizure, some of which have subtle or mild symptoms instead of convulsions. Seizures of all types are caused by disorganized and sudden electrical activity in the brain (Null et al., 1997; Shook et al., 1978).

Future prospectus for diagnosis and treatment of epilepsy:

It is quite pertinent that commonly available synthetic anticonvulsants do not adequately meet patient treatment demands.

1) Ketogenic diet- a highly fat, low carbohydrate diet developed with the advent of effective anticonvulsants. The mechanism of action is unknown. It is used mainly in the treatment of children with severe, medically intractable epilepsies (Vázquez et al., 1997).

2) Electrical stimulation- A currently approved device is vagus nerve stimulation. Investigational devices include the responsive neurostimulation system and deep brain stimulation (Bialer et al., 2004).

3) Vagus nerve stimulation- The device stimulates the vagus nerve at pre-set intervals and intensities of current. Efficacy has been tested in patients with localization-related epilepsies (MacDonald et al., 1997).

4) Responsive neurostimulator system (RNS)-It consists of a computerized electrical device implanted in the skull with electrodes implanted in presumed epileptic foci within the brain. The brain electrodes send EEG signal to the device which contains seizure detection software. When certain seizure criteria are met, the device delivers a small electrical charge to other electrodes near the epileptic focus and disrupts the seizure (Sparreboom et al., 2004).

Conclusion

Epilepsy is resistant to treatment with currently available anticonvulsant drugs which is not much effective. Nature is a rich source of biological and chemical diversity and a number of plants in the world have been used in traditional medicine, i.e., anticonvulsant, anxiolytic, analgesic, antidepressant. This work constitutes a literature review on *Ocimum* (Lamiaceae) which is medicinal plant showing anticonvulsant properties. *Ocimum* species are used to treat seizures and its anti convulsant activity is frequently reported by pharmacist of different part of the world.

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