

Ocimum sanctum - A PLANT WITH THERAPEUTIC POTENTIAL

M. Shynu

Assistant Professor, Department of
Veterinary Biochemistry, College of
Veterinary and Animal Sciences,
Pookot, Wayanad

Plants and plant based drugs have been used to treat various illnesses of man and animals since ages. Different alternative systems of medicine like ayurveda, siddha, homeopathy and even allopathy utilize many plant based drugs. Herbal medicines are still a potent source of therapeutic agents because of their effectiveness, easy availability and harmlessness. World Health Organization (WHO) has recommended to all member countries to actively promote native medicines of their respective country and initiate steps to conserve and/or to cultivate medicinal plants so that genuine raw materials become readily available to large section of population.

A number of medicinal properties viz., antipyretic, anthelmintic, expectorant, antimicrobial, anticancer, antiviral etc., have been described in various plants and a number of active compounds have been identified and purified. *Ocimum sanctum*, commonly called Tulsi or holy basil is one plant that has been used extensively in India to treat various ailments. Dry leaves, fresh leaf juice, decoction, flower tops, slender roots and seeds are used in traditional medicine to treat common cold to snake bite and cholera.

Ocimum is a genus under family Labiatae which consists of aromatic undershrubs or shrubs distributed in the tropical or warm temperature regions of the world. Out of the 60 species of plants which are mostly tropical, only six species are found in India.

Constituents of essential and fixed oil

Composition varies with the season and method of extraction. Major components of essential oil are eugenol, nerol, eugenol methyl ether, caryophyllene, terpine-4-ol, decylaldehyde, γ selinene, α and β pinene, camphor and carvacol. The leaves have also been reported to yield ursolic acid, apigenin, luteolin, apigenin-7-glucoside, orientin, molludistin.

Gas liquid chromatography of the fixed oil of *O. sanctum* revealed the presence of five fatty acids -stearic, palmitic, oleic, linoleic and linoleinic acids. Nickel, Chromium and zinc are also shown to be present in *O. sanctum*.

Pharmacological properties

Various pharmacological properties are exhibited by different fractions of *O. sanctum* which can be utilized for therapeutic purposes. Essential oil of leaves of *O. sanctum* is reported to have exhibited significant antipyretic activity in rats. Fixed oil of the plant has analgesic activity which is peripherally mediated due to the inhibition of prostaglandin. Extracts of seeds as well as leaves of *O. sanctum* possess some clotting accelerator which may be tannins and ascorbic acid.

O. sanctum is antiulcerogenic also. In one study pretreatment with *O. sanctum* significantly reduced macroscopic, histopathological and biochemical alterations associated with gastric ulcer. Leaves of *O. sanctum* and its benzene extract have been reported to show abortifacient and antifertility activity in rats. Leaf extract, boiled coconut oil extract (oral administration) and fixed oil (any route) show significant anti-inflammatory activity in rats and partially prevent the rise in aspartate amino transferase and alanine amino transferase activities associated with inflammatory reaction. This may be due to inhibition of arachidonate metabolism by linoleic acid present in the fixed oil. Antiasthmatic potential of *O. sanctum* leaves was also evaluated by experimental models. The alcoholic extract of the leaves was found to protect guinea pigs against histamine and pollen induced asthma.

Crude watery extract of *O. sanctum* leaves showed a transient hypotensive effect in anaesthetised

dogs and cats. A fall in systolic and diastolic pressure to the normal level in dogs, cats and human beings (suffering from essential hypertension) was observed following administration of leaf extract. Ethanolic extract of the leaves prevent changes in plasma level of corticosterone induced by noise which will also protect the heart from hypertension. So use of *Ocimum* was suggested in mega cities to combat noise induced hypertension. *O. sanctum* leaf extract also show antithyroid activity.

Antistress (adaptogenic) activity of *O. sanctum* is also well documented. Dried powder, ethanol extract of leaves and essential oil were found to enhance physical endurance and survival time of swimming mice, prevented alteration of corticosterone level and corrected behavioural and somatic reactions to stress. Ethanolic extract of dried leaf powder *O. sanctum* was also reported to normalize noise stress induced changes in total leucocyte count and differential leucocyte count. Hepatoprotective and cardioprotective actions of the plant or its extracts are also reported. The generation of adriamycin induced oxygen radicals in heart and liver microsomes was reduced by ursolic acid isolated from *O. sanctum*. Hypoglycemic activity

The hypoglycemic effect of ethanolic extract of *Tulsi* leaves was reported long back. The feeding of leaf powder or aqueous extract or ethanol extract of the plant was shown to reduce hyperglycemia in diabetic rats and normal albino rats under stress. Activity of 70% ethanol extract was comparable to that of tolbutamide. Studies revealed that *O. sanctum* has an active principle that favours the use of glucose in the cell and it acts by means of a mechanism different from that of insulin. Administration of *O. sanctum* leaf powder or fresh leaves produced desirable changes in the lipid profile of normal and diabetic albino rats. Significant reduction in total cholesterol, triglyceride, phospholipids and total lipids in blood, heart, kidney and liver were reported.

Insecticidal activity

O. sanctum extracts are reported to possess mosquito larvicidal, pupicidal and adulticide activity. Seed mucilage kills mosquito larvae by firmly attaching to its mouth parts and smoke of leaves suppresses the biting activity of mosquitoes.

Antifungal activity

Essential oil from *O. sanctum* leaves shows moderate antifungal activity against a variety of fungi, including

dermatophytes.

Antibacterial activity

The ether extract of *O. sanctum* leaves possess antibacterial activity against many pathogenic bacteria like *Staphylococcus aureus*, *Mycobacterium tuberculosis* etc. The essential oil also exhibited promising antibacterial activity against *Bacillus anthracis*, *Salmonella pullorum*, *Salmonella stanley*, *Pseudomonas aeruginosa* etc. Clinical trial with fixed oil either alone or in combination with cloxacillin for mastitis in buffaloes was highly effective

Antiviral activity

Various extracts of *O. sanctum* is reported to exhibit significant antiviral activity against Vaccinia, Ranikhet disease and poliovirus type -3 viruses. Some triggering effect to boost the viability of the virus infected cells also seem to exist. In a clinical trial, *O. sanctum* decreased the course of illness in patients with viral hepatitis and the biochemical parameters showed beneficial change. Aqueous extract was reported to significantly enhance survival rate in patients with viral encephalitis and decrease the incidence of residual neurological damage in recovered patients. Topical application of leaf paste and oral administration of fresh leaf juice was found effective in Herpes zoster, measles and mumps.

Immunomodulatory activity

O. sanctum and its extracts are reported to have effects on the humoral and cell mediated immune response. It is also reported to have an immunorestorative effect in betamethasone and cyclophosphamide treated animals which might be via stimulation of phagocytic function of the cells of reticuloendothelial system and activation of T helper lymphocytes resulting in enhanced antibody production. Studies on poultry naturally infected with Infectious bursal disease virus fed with dry leaf powder showed clear enhancement of humoral and cell mediated immune response.

Anticancer property

Extract of *O. sanctum* was reported to induce a lag in tumor development and the expressed juice from leaves was reported to completely inhibit the formation of all types of dimethyl benzantracene induced tumors. It was suggested that the juice may contain constituents that can inhibit promotion stage of carcinogenesis. Ethanolic extract of the

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