**Therapeutic activities of Ocimum tenuiflorum accounted in last decade: A review**

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**ABSTRACT**

*Ocimum tenuiflorum* is broadly distributed in Asia and occurred almost in all the seasons. *Ocimum tenuiflorum* synonym: *Ocimum sanctum* (English: Holy Basil) belongs to family Lamiacceae; Labiatae. The essential oil of fresh leaves from *Ocimum tenuiflorum* is found to contain Eugenol, β-caryophyllene, β-elemene and germacrene D as major phytochemical constituents. Recently, the extract of the *Ocimum tenuiflorum* has been established as potent in radioprotective activity. The review accounts for anthelmintic, antiaflatoxigenic, antibacterial, anticancer, antidepressant, antidiabetic, antifungal/anticandidal, antimetastatic, antimicrobial, antioxidant, antiprotozoal, antistress, antiviral, anxiety, cardio protective, chemoprotective, cognition improvement, hepatosupression, hyperlipidemia, immunomodulatory, noise stress release, renal damage recovery and wound healing activities.

**Keywords:** *Ocimum sanctum*, eugenol, anticancer, antidiabetic radioprotective, silver and gold nano-particles.

**INTRODUCTION:**

Since ancient time the plant *Ocimum tenuiflorum* synonym: *Ocimum sanctum* (Tulsi) family: Lamiacceae; Labiatae, the most sacred herb (English name: Holy Basil) of India is well known for its enormous therapeutic activities and prevention against diseases. *Ocimum tenuiflorum* plant is an admired deity herb native to India, extensively dispersed, cultivated over the globe. It was the Rig-Veda (3500-1600 B.C.), the first and earliest reference found in India quoting the medicinal plant was used as therapeutic medicine. The medicinal plant is claimed for its therapeutic application not only because they are safe but also easily available, economical and effective. The *Ocimum tenuiflorum*, plant as a whole (Leaves, stem, flower, root and seed) had been used in several traditional medicine system like Ayurveda, Greek, Siddhha, Roman, Unani for its range of therapeutic activities. The therapeutic activities such as analgesic, anticancer, antiasthmatic, antitumor, diaphoretic, antidiabetes, antidiabetic, antifertility, hepatoprotective, hypotensive, hypolipidemic and antistress have been attributed to *Ocimum tenuiflorum*.

**Here is an opportunity to discuss about newly biosynthesized nanoparticles.** Recently silver and gold nano-particles were biosynthesized using Krishna tulsi leaves. The method renders the hexagonal gold, silver nano-particles having size around 30 nm and 10-20 nm respectively. The water soluble ingredients present in the leaf extract of Krishna tulsi were responsible for the reduction of silver and gold metal ions and capping of nanoparticles. In another such rapid synthesis of silver nanoparticles, using dried basil and its antibacterial activity has been reported. The silver particle obtained using extract of sun dried root and stem were spherical and of sizes 10±2 and 5±1.5 nm respectively. The biomolecules present in the extract capped the silver nanoparticles and control the size of it. It was observed that the size of silver particle synthesized from stem extract were 62% more uniform than that from the root (30%), thus in conclusion phenolic and flavonoids play a key role in formation of silver particles. In biosynthesis of stable silver nanoparticles was done using Tulsi (*Ocimum sanctum*) leaf extract. These biosynthesized nanoparticles were characterized with the help of UV-Vis spectrophotometer, Atomic Absorption Spectroscopy (AAS), Dynamic light scattering (DLS), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and Transmission electron microscope (TEM). The stability of bio-reduced silver nanoparticles was analyzed using UV-vis absorbance spectra, and their antimicrobial activity was screened against both gram-negative and gram-positive microorganisms. It was observed that biosynthesis of stable silver nanoparticles of size range 4-30 nm possess antimicrobial activity.

Traditionally, *Ocimum sanctum* was used and known in treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery, dermal ailments, ophthalmic problems, insect bites. *Ocimum sanctum*, ethnomedicine has been known for its use as antifertility drug and its therapeutic activity.

**Therapeutic Activities:**

**Anthelmintic Activity:** Anthelmintic is also known as vermicide. Benzimidazoles have been known for anthelmintic activity. Albenodazole, Fenbendazole, Mebendazole, Thiabendazole are few known as effective anthelmintic. In this context, the essential oil of *Ocimum sanctum* and eugenol were tested in vitro and exhibits potent anthelmintic activity in the Caenorhabditis elegans model. Eugenol exhibited an effective dose ED(50) of 62.1 µg/mL. Eugenol being the predominant component of the essential oil, suggested as the potential candidate for anthelmintic activity.
Anti-aflatoxicogenic Activity: Aflatoxicogenic is the activity of fungi and bacteria to ferment the food stuff into non-edible form. The Ocimum sanctum essential oil and its major component, eugenol found active against the fungi causing biodeterioration of food stuffs during storage. Ocimum sanctum and eugenol were found effective in inhibiting the growth of Aspergillus flavus NKDHV8; and, their minimum inhibitory concentrations (MICs) were recorded as 0.3 and 0.2 µg·mL⁻¹ respectively. The LD (50) value of Ocimum sanctum essential oil on mice was found to be 4571.43 µg·kg⁻¹ and suggested its non-toxic nature[12].

Antibacterial/Antimicrobial Activity: With advance in medicinal chemistry, most of the antibiotics are synthetic or modified form of the naturally occurring compounds; however this does not restrict the quest for the new naturally occurring drug compounds. The aqueous extract of Ocimum sanctum leaves was investigated for its antibacterial and therapeutic potential against bovine sub clinical mastitis[13]. The isolation and characterization of the component/s of Ocimum sanctum was carried out with activity against Neisseria gonorrhoeae[14]. Escherichia Coli is the common bacteria found in the stock water bodies. The conventional chemical constituents of various plants were screened for evaluation of their efficiency for antibacterial activity. Ocimum sanctum is effective against Escherichia Coli, Salmonella typhi, Pseudomonas pyocyaneus, Vibrio Cholerae, Shigella dysenteriae and Proteus Vulgaris within specified contact time. Ocimum sanctum extract was found effective against Escherichia Coli with increase in specified contact time[15,16]. Methanol extract of Ocimum sanctum was found to have comparatively higher activity than other organic and aqueous extracts. Grampositive bacteria showed variable susceptibilities while Gram-negative Salmonella typhi has shown to be completely resistant to all the tested extracts. Minimum inhibitory concentration data showed hopeful results as some of the extracts exhibited significant inhibitions of bacteria even at low concentrations[17]. The chemical constituents of decoc- tion (individual) and concoction (mixed) of ethanolic leaf extracts from Azadirachta indica (neem) and Ocimum sanctum (tulsi) were analyzed by gas chromatography-mass spectrophotometer (GC-MS). The mixed extract had a high level of antimicrobial activity against fish pathogens as indicated by zone of inhibition, minimum inhibitory concentration, and minimum bactericidal concentration[18,19].

Anticancer Activity: Recent research on finding the cause of cancer reveals that the damage caused by free radical to DNA is the one of the reasons for carcinogenesis. The Ocimum sanctum has been well known for its antioxidant property with active ingredient such as eugenol and hence the plant has been studied for its anticancer activity. The protective effect of alcoholic extract of the leaves of Ocimum sanctum on 3-methylcholanthrene (MCA), 7,12-dimethyl-benzanthracene (DMBA) and aflatoxin B1 (AFB1) induced skin tumorigenesis in a mouse model was investigated. The leaf extract of Ocimum sanctum provides protection against chemical carcinogenesis in one or more of the following mechanisms: (i) by acting as an antioxidant; (ii) by modulating phase I and II enzymes; (iii) by exhibiting antiproliferative activity[20]. Mechanism for ethanol extracts of Ocimum sanctum as antitumor of was studied in A549 cells in vitro and the Lewis lung carcinoma (LLC) animal model. Overall, results demonstrate that ethanol extracts of Ocimum sanctum induces apoptosis in A549 cells via a mitochondria caspase dependent pathway and inhibits the in vivo growth of LLC, suggesting that ethanol extracts of Ocimum sanctum can be applied to lung carcinoma as a chemopreventive candidate[21]. Ocimum sanctum had been investigated against human fibrosarcoma cells (HFS cells) in culture. Administration of aqueous and ethanolic extracts at 50 µg/ml of Ocimum sanctum to mice bearing Sarcoma-180 solid tumors mediated a significant reduction in tumor volume and an increase in lifespan. These observations conclude Ocimum sanctum extracts possess anticancer activity[22].

Antidepressant Activity: Anxiety and depression are the major psychological disorder found in people all over the globe. Fluoxetine and venlafaxine have show greater efficacy than other known antidepressant in treatment of severe depression. The study was carried out for evaluation of comparative antidepressant activity of Ocimum sanctum and imipramine using animal models of depression. Imi- pramine (15 mg/kg, i.p) and herbal extract of Ocimum sanctum (500 mg/kg/ o.p) were subjected for its antidepressant activity using four different animal models of depression, viz: Forced Swimming Test (FST), Reserpine Reversal Test (RRT), Haloperidol-Induced Catalepsy (HIC) and Pentobarbitone Sleeping Time (PST) in male wistar rats. The results indicated the potential for use of Ocimum sanctum as a substitute in the treatment of depression[23].

Antidiabetic Activity: Diabetes is a group of metabolic disorder in which person has high sugar in blood either because body does not produce insulin which controls the sugar level or because cell fails to respond to the insulin that is produced. The mechanism of antidiabetic activity of potential drug can be evaluated by studying the various physiological pathways. Hannan et al. studied the effect of ethanolic extract and five partition fraction of Ocimum sanctum on insulin secretion from perfused pancreas. It was observed that ethanolic extract of Ocimum sanctum stimulate the physiological pathway of insulin secretion which may lie beneath its earlier reported antidiabetic activity[24]. The effect of ethanolic extract of Ocimum sanctum leaves were assessed on three important enzymes glucokinase (EK) (EC 2.7.1.2), hexokinase (HK) (EC 2.7.1.1) and phosphofructokinase (PFK) (EC 2.7.1.11) along with glycogen content of insulin-dependent and insulin-independent tissues from kidney and brain. It was found that the ethanolic extract of Ocimum sanctum attenuates the activity of enzymes studied without affecting the content of glycogen in any tissue[25]. The extract of Ocimum sanctum along with other two plant extracts was found to decrease the serum concentration of cortisol and glucose and hence could be a potential drug for curing corticosteroid induced diabetes mellitus[26]. The isolation and characterization of antidia- betic component from hydro alcoholic extract of Ocimum sanctum's aerial part. Ten fractions (F1 - F10) were isolated from hydro alcoholic extract of Ocimum sanctum aerial part by column chromatography. All the fractions F1 to F10 were screened for antidiabetic activity in alloxaan induced diabetic rats by estimating serum glucose level and lipid parameters. The bioactive fraction (F5) was found to be potent antidiabetic by ameliorating glucose and lipid parameters (total cholesterol, triglycerides, low and high density lipoprotein cholesterol). The extensive spectroscopic data analysis reveals, the isolated bioactive compound elucidated as tetracyclic triterpenoid [16-Hydroxy-4,4,10,13-tetramethyl-17-(4-methyl-pentyl)-hexadecahydro-cyclopenta[a]phenanthren-3-one]. The study concluded that, tetracyclic triterpenoid isolated from aerial part of Ocimum sanctum has a great anti-diabetic potential[27].

Antifungal/anticanidal Activity: Mycosis is the common fungal infection caused in human and animal by inhalation of fungal spores or contact of fungal colony with skin. The fungal infection can be avoided by keeping the body hygienic. However, there is need for natural fungicide. The GC-MS analysis of Ocimum sanctum's essential oil showed a high content of methyl chavicol (44.63%) and linalool (21.84%). Study revealed that Ocimum sanctum essential oil has significant antifungal activity against Candida and hence it can be applied in treatment of fungal infections[28, 29]. The antifungal activity of Ocimum sanctum essential oil enhanced by its synergy with established azole antymycotics-fluconazole and ketoconazole. In seventy four fluconazole-sensitive and sixteen fluconazole–resist Candida the antifungal activity were studied and signify a promising candidature of Ocimum sanctum essential oil extract as antifungal agent in combination treatment of candidosis[30]. The combination of ethanolic
extracts of leaves of *Cassia alata* and *Ocimum sanctum* had been reported for anti-Cryptococcus activity even at higher temperature and acidic pH[31]. The antifungal activity of *Ocimum sanctum* leaves was investigated against dermatophytic fungi by 38 A NCCLS method and observed 200 mu g/mL as a Minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC)[32]. In another mechanism, the extract of *Ocimum sanctum* acts as antifungal activity by disturbing egosetor biosynthesis and membrane integrity[33].

**Anti-metastatic Activity:**
Metastasis is spread of diseases from an organ to part or no-adjacent part of the body. Metastatic progression of tumor cell is associated with change in anti-oxidant enzymes. The ethanolic extract of *Ocimum sanctum* investigated for its anti-metastatic activity via activation of anti-oxidative enzymes and inactivation of metalloproteinase-9 (MMP-9). The ethanolic extract put cytotoxicity against Lewis lung carcinoma (LLC) cells[34].

**Antioxidant Activity:**
The hydroalcoholic extract of *Ocimum sanctum* leaves was investigated for its antioxidant activity in animal models of peptic ulcer. The antioxidant activity was evaluated by estimating plasma MDA (Malondialdehyde bis Dimethyl Acetal) in ethanol treated rats and histamine treated guinea pigs. Whereas SOD (Superoxide dismutase) was estimated in pyloric ligated rats and histamine treated guinea pigs. In ethanol treated rats *Ocimum sanctum* leaves extract significantly decreased the level of MDA in comparison to the control (diseased rat) and similar results were observed in level of SOD in histamine treated guinea pig groups[35]. Another study describes the antioxidant activity of *Ocimum sanctum* extract by evaluating with six different in vitro anti-oxidant-testing system like scavenging superoxide anion radical, 1,1-diphenyl-2-picrylhydrazyl radical (DPPH), hydroxyl radical, hydrogen peroxide, chelating ferrous ion and ferric ion reducing potential[36]. The study include effect of concentration, heat treatment and pH on the antioxidant activity of ethanolic extract of *Ocimum sanctum* and Galangal shows that *Ocimum sanctum* ethanolic extract has good heat stability (80 °C, 1h) and anti-oxidative stability in neutral and acidic pH[37]. The fresh leaves and stems extract of *Ocimum sanctum* owing compounds; cirsilineol, cirsimaritin, isothymusin, isothymonin, apigenin, rosmarinic acid, and appreciable quantities of eugenol. Isolated compounds found exhibited good antioxidant activity even at 10-µM concentration. Eugenol demonstrated 97% and other shows 58% anti-inflammatory activity at 1000-µM concentrations[38]. Prolong oral administration of *Ocimum sanctum* enhance cardiac endogenous antioxidants and prevents isoprotenol-induced myocardial necrosis in rats[39]. The anti-oxidant property of *Ocimum sanctum* has been studied by noise exposure in case of mice[40].

**Antiprotozoal Activity:**
Leishmaniasis is a group of tropical diseases caused by a number of species of protozoan parasites belonging to the genus *Leishmania*. This ailment affects millions of peoples all over the globe and it is estimated that there are about two to three million new cases each year. In the course of screening leishmanicidal active compounds from Asian and South American medicinal plants, a Nepalese medicinal plant, Tulsi (*Ocimum sanctum* L.), showed strong activity[41].

**Antistress Activity:**
Defiance to desire creates stress in human, which is the common problem in developing country. The *Ocimum sanctum* was also tested for the stress relief property, since it is previously well known for its number of therapeutic applications. Ocimumosides A, ocimumosides B and ocimarin are the three compounds isolated from an extract of leaves *Ocimum sanctum* with eight other known substance, apigenin, apigenin-7-O-ß-D-glucopyranoside, apigenin-7-O-ß-D-glucuronic acid 6''-methyl ester, luteolin-7-O-ß-D-glucuronic acid 6''-methyl ester, luteolin-7-O-ß-D-glucopyranoside, luteolin-5-O-ß-D-glucopyranoside and 4-allyl-1-O-ß-D-glucopyronosyl-2-hydroxybenzene and two known cerebrosides. Ocimumosides A shows promising Antistress effect by normalizing hyperglycemia, plasma corticosterone, plasma creatine kinase and adrenal hypertrophy, whereas ocimumosides B and ocimarin were also effective in normalizing most of these parameters[43]. Fresh leaves of *Ocimum sanctum* were evaluated for antistress activity against experimentally induced oxidative stress in albino rabbits. Animals of the test group received supplementation of 2 g fresh leaves of *Ocimum sanctum* per rabbit for 30 days. Anemic hypoxia was induced chemically by injecting the rabbits with 15 mg sodium nitrite per 100 g body weight intraperitoneally. The results of this study suggest that the potential antistressor activity of *Ocimum sanctum* is partly attributable to its antioxidant properties[44]. The study was carried out to evaluate the ameliorative effects of *Ocimum sanctum* and *Camellia sinensis* on stress-induced anxiety and depression. It was found that *Ocimum sanctum* and *Camellia sinensis* possess anxiolytic and antidepressant activities[45].

**Antiviral Activity:**
A virus is a minute infectious agent, which lacks independent metabolism and replicate only in host living cell. There are thousands of viruses reported after the discovery of first tobacco mosaic virus and there are millions of them in each ecosystem. Medicinal plants are traditionally used for various diseases and there is rising need of substances for the treatment infectious diseases. The study demonstrated anti-herpes simplex virus activity of dichloromethane and methanol extracts of *Ocimum sanctum* L., *Ocimum basilicum* L. and *Ocimum americanum* L. Dichloromethane and methanol extracts of *Ocimum sanctum* L., *Ocimum basilicum* L. and *Ocimum americanum* L. showed anti-HSV activities at various steps of the viral multiplication cycle[46].

**Anxiety Activity:**
Recent studies introduced the concept of mixed anxiety and depressive disorders (MADD). The study evaluated the ethanol leaf extract of *Ocimum sanctum*, a prominent medicinal plant, against both anxiety and depressive disorder, to evaluate its potency in combating MADD. The *Ocimum sanctum* extracts show antianxiety and antidepressant properties at the same dose and can be a potential therapeutic agent against mixed anxiety and depressive syndrome[47].

**Cardio protective Activity:**
The study investigates the cardioprotective activity of a combined treatment of *Ginkgo biloba* phytosomes (GBP) and *Ocimum sanctum* extract in isoproterenol (ISO)-induced myocardial necrosis in rats. However, the combined treatment failed to enhance cardioprotective activity of either herb when used alone[48].

**Chemoprotective Activity:**
*Ocimum sanctum* extract had found to inhibit the DNA–binding activity of 7, 12-dimethylbenz[a]anthracene in rat hepatocytes in vitro. Study elaborates the culture of rat hepatocytes were treated with 0-500 μg of *Ocimum sanctum* extract for 24 hr and then DMBA (10 or 50 μg) for 18 hr. On harvesting the DNA and studying its 32P-postlabeling it was found that *Ocimum sanctum* extract inhibits or suppress the events responsible for chemical carcinogenesis[49].

**Cognition improvement Activity:**
Along with antioxidant, anti-inflammatory activity the methanolic of *Ocimum sanctum* cognition-enhancement properties has been studied and it was found that *Ocimum sanctum* may be useful in treatment of cerebral reperfusion injury and cerebrovascular insufficiency states[50]. Giridhar et al. investigated the effects of the aqueous (300 and 500 mg/kg) and alcoholic (300 and 500
mg/kg) extracts of Ocimum sanctum leaves as an antidementic, anticholinesterase and immunostimulant agent in rats. The rats were given electroshock, atropine, and cyclosporine to induce dementia. The study concluded as potential candidature of Ocimum sanctum in treatment of cognitive dysfunctions in rats[51].

 Hepatoprotective Activity: 
Ocimum sanctum has been reported to exhibit hepatoprotection against the CC14 induced liver dysfunction in rat. The investigation on the potential hepatoprotective action of Ocimum sanctum whole plant powder against CC14 induced liver damaged wistar rat model shows very high potential in healing liver parenchyma as well as regeneration of liver cells. The overall effect of Ocimum sanctum whole plant powder is compared with Silymarin by using standard protocol and is found to have better hepatoprotective action[52].

Hyperlipidemia: 
It has been reported that Ocimum sanctum L. leaves decrease serum lipid profile in normal and diabetic animals. However no experimental evidences support the anti-hyperlipidemic and antioxidative actions against hypercholesterolemia. Moreover the identities of the specific chemical ingredients in Ocimum sanctum leaves responsible for these pharmacological effects are unknown. Since Ocimum sanctum leaves are rich in essential oil. The study was conducted to investigate the anti-hyperlipidemic and antioxidative activities of essential oil extracted from Ocimum sanctum leaves in rats fed with high cholesterol diet. Eugenol that is contained in essential oil likely contributes to these pharmacological effects[53].

Immunomodulatory Activity: 
An aqueous extract of Ocimum sanctum were administered in wistar albino rats for 45 days at doses 100, 200 mg/day. The Immunomodulatory effect and biochemical and haematological changes were studied against control. An oral administration of Ocimum sanctum extract showed stimulation in antibody production in dose dependent manner without altering the biochemical parameter, wherein enhancement of WBC, RBC and Haemoglobulin[54]. The seed oil of Ocimum sanctum was evaluated on some immunological parameter in both stressed and non-stressed animals and it was found that the oil shows immunomodulatory effect may via GABAergic pathways[55]. The effect of leaf extract of Ocimum sanctum was investigated for specific and non-specific response in Oreochromis mossambicus and found disease resistance against Aeromonas hydrophila. The Ocimum sanctum has been suggested for its immunostimulating activity in maintenance of finfish aquaculture[56]. In another such study it was revealed that aqueous extract of Ocimum sanctum enhances the phagocytic activity and phagocytic index[57]. Tirthathy et al. observed the modulatory effect Ocimum sanctum on cyclophosphamide-induced immunosuppression in rats. The extract of Ocimum sanctum showed significant increase in lymphocyte proliferation in rats[58].

 Noise stress release Activity: 
The white noise exposure (100 dB) in wistar male albino rats significantly increased the level of dopamine (DA), serotonin (5-HT) and 5-HT turnover in many of the discrete brain region. This increasing change in the biogenic amine prevented by intraperitoneal administration of 70% ethanolic extract of Ocimum sanctum at the dosage of 100 mg /Kg. The study indicates Ocimum sanctum can be a probable herbal remedy for noise stress release[59].

Radioprotective Activity: 
The tsunami disaster followed by the radioactive material exposure in Japan March 2011, the protection from the radioactive substance became a serious concern all over the globe. An exposure to the radioactive material cause change in DNA (mutation) leading to cancer or tuberculosis. This damage has been explained through the high level of free radicals that are generated after the radioactive exposure. As in many traditional reports the Ocimum sanctum has been well recognized anti-oxidant.

The study investigated the radioprotective effect of Ocimum sanctum on the salivary gland of rats administered radioiodine[60] and compared its efficacy with a known radioprotectant, amifostine. The study indicates possible radioprotective effect of Ocimum sanctum and amifostine against high-dose I131 exposure[60]. The antioxidant activity of two polysaccharides isolated from the Indian medicinal plants, Ocimum sanctum and Tinospora malabarica, was studied. Only the Ocimum sanctum polysaccharide showed significant activity and could prevent oxidative damage to liposomal lipids and plasmid DNA induced by various oxidants such as iron, AAPH and gamma-radiation, besides scavenging important ROS such as the superoxide radical and hydrogen peroxide and inhibiting xanthine oxidase. In addition, Ocimum sanctum polysaccharide could prevent gamma-radiation-mediated cell deaths in mouse splenocytes[61].

 Renal damage recovery Activity: 
In most animals’ species, including human the kidney is one of the main sites of deposition of inorganic mercury and target organ for its toxicity. The investigation reports protection against mercury-induced toxicity by Ocimum sanctum Swiss albino mice were divided into four groups. (i) Control group-only vehicle (0.9% NaCl) was given (ii) HgCl2-treated group-5.0 mg/kg b.w. HgCl2 administered as p.o. (iii) Ocimum treated group-10 mg/kg b.w. Ocimum leaves extract was administered orally. (iv) combination of group-Ocimum leaves extract was administered 10 days prior to mercuric chloride administration and continued up to 30 days after mercuric chloride administration (5.0 mg/kg b.w.). The animals were autopsied on day 1, 3, 7, 15 and 30 after treatment. The results suggested that pre-and post-treatment of Ocimum sanctum leaves extract can significantly protect the renal damage against mercuric chloride-induced toxicity[62].

Wound healing Activity: 
The extract of Ocimum sanctum was studied for wound healing and anti-oxidant property. An increased per cent wound contraction was observed in case of extract administrated rats. The study suggested that extract can be useful in the abnormal healing such as keloids and hypertropic scars[63]. In another study during wound healing phase TNF-a level was found to be up regulated by Ocimum sanctum treatment[64, 65].

CONCLUSION: 
The review discuss critical on therapeutic activity of Ocimum tenuiflorum (Ocimum sanctum) merely reported in last decades. The most of the activities expressed for Ocimum tenuiflorum are because of the antioxidant ingredient present in the plant extract. The therapeutically active ingredients eugenol, b-caryophyllene, b-elemene, germacrene D, flavonoids and glycosides were found in Ocimum tenuiflorum. The recently isolated Ociminosides A, constituent of Ocimum sanctum has been found promising in anti-stress activity. In all the aspect, it has been observed that the anti-oxidant property bear by Ocimum sanctum is responsible for its therapeutic application. The extracts of the Ocimum sanctum alone and its combination with customary drugs or other plant extract have been found potential for therapeutic activity. Among the enlisted disease Ocimum sanctum has prominently antican- cer, anti diabetic, cardio protective activities; these diseases are most challenging for medicinal development.

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