HOLY BASIL

(*Ocimum sanctum*)

An Overview of the Research and Clinical Indications

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This herb research review is intended to be used by authorized health care practitioners, clinicians, pharmacists, physicians, and any other professionally trained persons who may provide medical advice to patients or consumers. The information presented has been obtained from research of reference books, clinical and scientific published papers, and other published works. The lay reader is advised to consult a licensed health care practitioner regarding the information contained herein.

BACKGROUND AND USES

Holy Basil, also known in Ayruvedic tradition as Tulsi, and formally named Ocimum sanctum, is an indigenous plant in India and Southeast Asia. Numerous ancient systems of medicine value this plant for its medicinal properties, including Ayurveda, Greek, Roman, Siddha and Unani[1].

Holy Basil, *Ocimum sanctum,* should not be confused with Sweet Basil, *Ocimum basilicum,* which is commonly used for culinary purposes.

In India, Holy Basil's name of Tulsi translates to "incomparable one" and is considered sacred anywhere it is grown[2]. It is the most sacred plant in the Hindu religion. Holy Basil is an important part of religious ceremonies. Like a number of other medicinal herbs from other parts of the world, it is thought to provide protection for homes where it is cultivated. The smell of the plant is effective in keeping away insects that typically spread disease, such as mosquitoes and flies.

In the United States of America, Holy Basil has been granted "Generally Recognized as Safe" (GRAS) status by the FDA.

Holy Basil is valued for its versatility in helping to restore health where imbalance is the cause of illness.

ACTIVE CONSTITUENTS

Numerous constituents of Holy Basil have been identified; they include: eugenol [4,5], cinnamyl acetate [5], and beta-elemene [5]. Extraction of the fresh leaves and stems of *Ocimum sanctum* yielded the following compounds: cirsilineol, cirsimaritin, isothymusin, isothymonin, apigenin, rosmarinic acid, and appreciable quantities of eugenol [6].

Polysaccharides have been found [7], along with flavonoids, including orientin and vicenin [8]. Holy Basil also includes trace levels of zinc and other minerals [9], ursoloic acid [10,11], and at least five fatty acids (stearic, palmitic, oleic, linoleic and linolenic acids) [12].

MECHANISM OF ACTION

Holy Basil has numerous mechanisms of action. Its beneficial effects are found across quite a few categories of medicinal activities, including anti-stress, anti-lipidemic, anti-diabetic and glycemic lowering properties. For the scope of this research review, this paper will focus on specific properties. The constituent eugenol (1-hydroxy-2-methoxy-4-allylbenzene) is thought to be of particular benefit [4], as demonstrated in numerous applications.

RESEARCH SUMMARY

Anti-stress properties

Male mice were used as the subjects of a study that demonstrated the lowering of serum concentrations of cortisol and glucose through the use of plant extracts of Ocimum sanctum [18]. Lipid peroxidation was not enhanced. The study also showed an anti-peroxidative effect from the extract, suggesting a potential regulation of corticosteroid-induced diabetes [18]. If this effect is found in humans, it could benefit patients who experience adverse side effects from the use of corticosteroids. It could also benefit patients whose blood sugar regulation is compromised from the upregulation of serum cortisol. A commonly experienced side effect of the use of corticosteroids is increased appetite, including sugar cravings, weight gain and disturbed carbohydrate metabolism.

One study examined the use of Ocimum sanctum to help the subjects better withstand the stress of chronic exposure to noise. The study used albino rats that were pre-treated with an ethanolic extract of Ocimum sanctum leaves for seven days. These rats were then exposed to noise at the frequency of 10 kHz and sound level of 100 dB. This pre-treatment prevented noise-induced changes in acetylcholine and acetylcholinesterase activity in the cerebral cortex, corpus striatum, hypothalamus and hippocampus [22].

Another study using Wistar male albino rats, via intraperitoneal administration of 70% ethanolic extract of Ocimum sanctum, dosed at 100 mg/kg body weight, were able to withstand sub-chronic broadband white noise exposure at 100 dB for four hours a day for a total of 15 days. This administration of the extract prevented noise-induced increases in the levels of the neurotransmitters dopamine and serotonin turnover in specific brain regions. The brain regions noted include the cerebral cortex, cerebellum, hypothalamus, hippocampus, pons-medulla and corpus striatum. The noise-induced increases were prevented and normal levels of the neurotransmitters were not affected [23, 24].

Other studies using animal models have shown treatment with Ocimum sanctum to be effective in treating noise-induced stress changes, including changes in cortisol levels [25, 26]. The active principle appears to be best represented in the cold homogenized leaf extract [27].

Anti-lipidemic properties

Ocimum sanctum and eugenol lowered restraint stress-induced cholesterol levels; [20] they also effectively lowered the restraint stress-induced elevations in lactate dehydrogenase (LDH) and alkaline phosphatase [20]. A reduction in total cholesterol, triglyceride, phospholipids, and total lipids, in the liver, kidney, or heart was demonstrated by the addition of Ocimum sanctum leaf powder to the diet of diabetic and non-diabetic rats [19].

A study done using normal albino rats, given fresh leaves of Ocimum sanctum, showed significant increases in HDL-cholesterol and total fecal sterol contents, and decreases in serum total cholesterol, LDL cholesterol, phospholipids and triglyceride levels. The subjects of the study were given 1 – 2 grams of the fresh leaves mixed into a 100 g diet for two weeks.

Anti-diabetic and glycemic lowering properties

In a study done with rats, the use of an extract of Ocimum sanctum resulted in the partial correction of diabetes-induced inhibited activity concerning 3 enzymes that are part of carbohydrate metabolism [13]. The extract was dosed at 200 mg/kg for 30 days. The enzymes noted were glucokinase, hexokinase and phosphofructokinase. A plasma glucose decrease was also noted during this study (and observed in other animal studies [14, 15, 16, 17, 18] as well). Reduction of fasting blood sugar was observed with the addition of Ocimum sanctum leaf powder to the diet of diabetic rats; uronic acid and total amino acids were also reduced [19].

Hepatoprotective properties

This study showed significant hepatoprotection from the use of a Holy Basil alcoholic leaf extract when used alone, and synergistic hepatoprotection in conjunction with silymarin[3]. The agent used in the study to induce hepatic harm was paracetamol (acetaminophen). The underlying motivation for the study was a desire to identify reliable hepatoprotective drugs and agents in modern medicine to prevent and treat drug-induced liver damage.

The subject albino rats (150-200 g) were divided into five groups; groups A and B were normal and experimental controls, respectively. Groups C, D and E received the alcoholic extract of Ocimum Sanctum leaves (OSE) 200 mg/kg BW/day, silymarin 100 mg/kg BW/day and OSE 100 mg/kg BW/day + silymarin 50 mg/kg BW/day p.o., respectively, for 10 days. Hepatotoxicity was induced in Groups B, C, D and E on the eighth day with paracetamol 2 g/kg BW/day. The hepatoprotective effect was evaluated by performing an assay of the serum proteins, albumin globulin ratio, alkaline phosphatase, transaminases and liver histopathology.

RESULTS:
In groups C, D and E, liver enzymes and albumin globulin ratio were significantly closer to normal than in group B. Histopathological examination demonstrated reduction in sinusoidal congestion, cloudy swelling and fatty changes, and regenerative areas of the liver were observed in groups C, D and E, whereas group B showed only hepatic necrosis.

CONCLUSION:
The Ocimum sanctum alcoholic leaf extract shows significant hepatoprotective activity and synergism with silymarin.

CLINICAL INDICATIONS, PRACTITIONER DOSING, CONTRAINDICATIONS AND TOXICITY

Clinical Indications

- Promote protection from effects of stress
- Improve resilience to stress and recovery from stress
- Chronic stress recovery
- Cholesterol imbalances
- Anti-lipidemic
- Anti-diabetic and glycemic lowering effects
- Hepatoprotective

Dosage range

For general preventive therapy, the dosage range recommended in review literature is 300 mg – 2,000 mg of Holy Basil extract for a single dose on a daily basis. For curative therapy, 600 – 1800 mg daily in divided doses have been used. For diabetes, 2,500 mg dried leaf powder ingested daily, or one tsp. of the dried herb brewed daily in 1 cup of water have been used.

Contraindications

Having been granted "Generally Recognized as Safe" (GRAS) status in the United States of America by the Food and Drug Administration (FDA), Holy Basil is well tolerated by most people. Animal studies have shown that it may cause hypoglycemia [19, 28] and prolonged bleeding time [29].

Patients with known allergy/hypersensitivity to *Ocimum sanctum*, its constituents, or to members of the Lamiaceae family, should avoid using this botanical agent.

Based on animal studies, use cautiously in:

- Patients with hypoglycemia
- Patients with bleeding disorders or those taking anti-coagulant or anti-platelet drugs
- Patients who want to conceive a child due to possible anti-spermatogenic or anti-fertility effects
- Pregnant and breastfeeding women, as Holy Basil may stimulate uterine contractions, based on traditional use

Toxicity

There are no reports to date of toxicity with the use of Holy Basil.

CONCLUSIONS

The overall botanical medicine benefit profile for Holy Basil makes it a viable botanical agent for promoting improved resilience to stress, recovery from chronic stress and avoidance of acute and chronic stress-induced physiologic changes. Holy Basil also provides support for improving serum cholesterol and lipid profiles, diabetes treatment and glycemic control. It offers hepatoprotective effects, including prevention of drug-induced liver damage.

It appears to be a safe herb for medicinal use, as it has been used for hundreds of years without major incident.

ABOUT THE AUTHOR

Dr. Beverly Yates, Naturopathic Physician, graduated from the National College of Naturopathic Medicine in 1994. She is also a graduate of the Massachusetts Institute of Technology with a B. S. degree in Electrical Engineering. Dr. Yates served as the lead supervising doctor for the first ever fully accredited Naturopathic and Integrative medical residency in the state of California. Dr. Yates was a Featured Speaker for the California Naturopathic Doctors Association Integrative Medicine conference on Cardiology, presenting continuing medical education on Women and Cardiovascular Disorders.

Dr. Yates serves as a National Media Representative for the American Association of Naturopathic Physicians, appearing as an expert in natural medicine on TV shows in select metropolitan areas. She is a member of the Medical Advisory Board for Schwabe North America, and is on the Scientific Advisory Board for Gaia Herbs, Inc. and BSP Pharma, Inc. Recently, in response to Dr. Yates' contributions to community health, she provided testimony for the Tri-Caucus of the California legislature concerning the

growing impact of obesity and diabetes in communities of color around the state and the country.

Sought after for her ability to provide concise, clear explanations about medical processes and natural medicine, Dr. Yates has appeared on numerous TV broadcast networks including ABC, CBS, CNN, CW, Fox, NBC, and PBS; her radio interviews include NPR, CNN Radio, and Sirius International Satellite; and her print interviews include Essence Magazine, Good Housekeeping Magazine and Women's World newspaper. She presents continuing medical education (CME) to physicians and other health professionals all over the country.

Dr. Yates is a nationally recognized author [book: Heart Health for Black Women: A Natural Approach to Healing and Preventing Heart Disease, Marlowe & Co., 2000] and contributing author [medical textbook: Maternal Newborn and Child Nursing: Family Centered Care, Prentice Hall, 2003].

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