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A Review on Antiulcer, Antidiabetic and Hepatoprotective Activity of *Ocimum sanctum* and *Musa paradisiaca*

	
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ABSTRACT

The traditional system of medicine also known as indigenous or folk medicine encompasses medical aspects of traditional knowledge that developed over generation within various societies before the era of modern medicine. Traditional medicine practitioners use medicinal plants for curing various ailments. *Ocimum sanctum* known as tulsi or holy basil is a small herb seen throughout India. Because of its great therapeutic system of medicine have been using *Ocimum sanctum* for curing various ailments. *Musa X paradisiaca* is a hybrid between *Musa accuminata* and *Musa balbisiana*. It is one of the oldest cultivated plants which is highly effective in a wide spectrum of diseases. In this review, attempts have been made to know about *Ocimum sanctum* and *Musa X paradisiaca* which may be used in traditional system of medicine for the treatment and prevention of various diseases such as ulcer, diabetes, hepatic diseases, etc.



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INTRODUCTION

India is popular for its traditional system of medicines such as Ayurveda, Siddha, and Unani which is mentioned in various ancient Vedas and other scriptures. In India, the history of health care systems goes back to 2500 and 500 years BC which was mentioned in works of literature such as Rig Veda, Atharva Veda, Charak Samhita, and Sushruta Samhita. Ayurveda offers a complete system to live a healthy life and also offers programmes to rejuvenate the body through diet and nutrition. The use of medicinal plants as a component of the traditional health care system is one of the oldest the most assorted of all therapeutic systems. It is one of the most easily accessible and affordable health resources. Medicinal plants are considered to be an important contribution to primary health care during ancient times. Studies on the traditional medicinal plant are important in the development of healthcare and conservation programs.¹

Ocimum sanctum is a sacred plant that belongs to the family Labiate. In the traditional system of medicine, *Ocimum sanctum* is used for the treatment of various ailments such as asthma, bronchitis, diarrhoea, malaria, dysentery, skin diseases, arthritis, eye diseases, insect bites and so on. *Ocimum sanctum* also possess antifertility, anticancer, antidiabetic, antifungal, antimicrobial, cardioprotective, analgesic, antispasmodic actions.²

Musa x paradisiaca is a hybrid between *Musa accuminata* and *Musa balbisiana* that belongs to the family Musaceae. Banana is the oldest cultivated plant with a wide range of therapeutic value. Flowers are used for the treatment of dysentery, ulcers, bronchitis, and diabetes. The sap of *Musa paradisiaca* is used for the treatment of leprosy hysteria, fever, digestive disorders, haemorrhage, epilepsy and insect bites. Roots and seeds are used for the treatment of digestive disorders. Peel and pulp of *Musa paradisiaca* contain antifungal and antibiotic principles. *Musa paradisiaca* also contain norepinephrine, serotonin, dopamine. Norepinephrine and dopamine elevate blood pressure whereas serotonin inhibits gastric secretion and stimulates the smooth muscles of the intestines. Banana has been used as an antacid in the treatment of peptic ulcer because they protect the stomach from ulcers and ulcer damage. Banana forms a thick mucus barrier that protects from stomach acids and also contains protease inhibitors that eradicate bacteria causing stomach ulcers.³

REVIEW OF LITERATURE

ANTIULCER ACTIVITY

1 Mahadeva Rao et al 2016⁴: Conducted a study on *Musa paradisiaca* tepal and skin extract for the evaluation of the antiulcer activity. Peptic ulcer was a sore on the lining of the GIT caused due to mucosal erosions. It is one of the most prevalent GI disorder occur due to an imbalance of defensive and aggressive factors. Aggressive factors include increased HCl production and pepsin secretion, parietal cell mass and gastric production. Defensive factors include prostaglandin, increased mucosal cells. The major approach of treatment of ulcers is to reduce the amount of acid produced by the stomach, to neutralise the acid and to protect the injured area giving it sufficient time to heal. Phytochemical screening of extract indicates the presence of alkaloids, glycosides, flavonoids, saponins. Glycoside and Phenol are present plentiful in tepal of the plant. Skin of the plant is copious in flavonoid. Phenolic compounds result in increased secretion of mucus and possess anti-inflammatory activity due to free radical scavenging activity. Aucubin, a glycoside present in *Musa paradisiaca* possess antihistaminic activity and prevent the advancement of the ulcer. Pylorus ligation causes erosion due to stimulation of acid and pepsin in the abdomen. Administration of indomethacin to test animals showed a significant increase in ulcer index as compared to control. Administration of cimetidine to test animals decreases ulcer index. Cimetidine pre-treated group produces 72.14% protection. Tepal and skin pre-treated group produces 68.80% and 43.22% protection. Also, tepal and skin pre-treated group showed no significant reduction of gastric juice volume when compared to the induced group. But they offer and a significant rise in pH and strengthening of gastric mucus walls when compared to the induced group. The tepal extract shows the presence of flavonoids, saponins, glycosides and phenols in an abundant quantity which could be attributed to its higher antiulcerogenic effect than standard drug.

2 Surender Singh, et al (1999)⁵ Conducted a study on fixed oil of *Ocimum sanctum* for the evaluation of the antiulcer activity. Based on the study it could be concluded that the fixed oil of *Ocimum sanctum* may possess significant ulcer protective activity. The ulcer protective effect may be attributed to the lipoxygenase inhibitory, histamine antagonistic and anti-secretory effect of the oil. The fixed oil of *Ocimum sanctum* significantly reduces ulcer index in a dose dependent manner. NSAIDs such as aspirin and indomethacin induce gastric ulcer due to inhibition of Prostaglandin biosynthesis which acts as cytoprotective agents. Hence

fixed oil of *Ocimum sanctum* possesses antiulcer activity against aspirin and indomethacin-induced gastric ulcer due to its 5-lipoxygenase inhibitory effect thereby inhibiting the biosynthesis of cytoprotective prostaglandins.

Ethanol induces gastric ulcer due to inhibition in gastric blood flow leading to the development of haemorrhage and necrotic feature of tissue injury. Leukotriene antagonist and 5-lipoxygenase inhibitors are effective in inhibiting alcohol and NSAIDs induced gastric ulcer. Thus it can be attributed that *Ocimum sanctum* inhibits alcohol and NSAIDs induced gastric ulcer by 5-lipoxygenase pathway inhibition or leukotriene antagonistic activity. Histamine-induced gastric ulcer occurs due to enhanced gastric acid secretion as well as by vasospastic action of histamine. Thus it can be attributed that fixed oil of *Ocimum sanctum* suppresses histamine-induced vasospastic effect and gastric secretion. Fixed oil of *Ocimum sanctum* can inhibit both gastric output and total acidity. Degranulation of gastric mast cells and liberation of histamine causes reserpine-induced gastric ulceration. The antiulcer activity of fixed oil of *Ocimum sanctum* could be due to histamine antagonistic and anti-cholinergic effect. The fixed oil of *Ocimum sanctum* helps to improve disturbance of gastric mucosal microcirculation due to serotonin-induced gastric ulceration. The fixed oil of *Ocimum sanctum* possesses protective action against stress-induced ulcer due to histamine antagonistic, anticholinergic and anti-secretory activity.

Ocimum sanctum is of great therapeutic important because most of the anti-inflammatory drug used are ulcerogenic. Thus *Ocimum sanctum* mixed oil may be considered as a drug of natural origin which possess both anti-inflammatory and anti-ulcer activity.

ANTIDIABETIC ACTIVITY

1. **Vijai Lakshmi et al (2014)**⁶ Conducted a study in Streptozotocin-induced diabetic rats to evaluate the diabetic potential of *Musa paradisiaca*. This study demonstrated that leaves and ripe fruit peel have an anti-diabetic effect. Various chemical constituents such as carbohydrates, catecholamines, several flavonoids, and related compounds are isolated from *Musa paradisiaca*. When compared to the standard drug metformin the hexane and chloroform fractions of fresh leaves show significant anti-diabetic activity than ethanol extract and n-butanol fractions. In case of ripe fruit peels, the ethanol extract and chloroform fraction show significant antidiabetic activity than hexane and n-butanol fractions.

2. Utsav et al (2016)⁷ Conducted a study in mice diabetic model to evaluate the antidiabetic activity of *Ocimum sanctum* extract. *Ocimum sanctum* commonly known as tulsi that belongs to the family Lamiaceae various chemical constituents such as eugenol, ursolic acid, rosmarinic acid, phenolic compounds, flavonoids, terpenes, and other active compounds are isolated from *Ocimum sanctum*. The dried plant sample was saturated with methanol extract was used to study hypoglycemic activities in STZ induced mice, diabetic models. The animal model was based on multiple administration of low dose of freshly prepared STZ. Animals showing fasting blood glucose level of 200mg/dl or higher were considered to be diabetic and included in the study. Animals were divided into 5gps (n = 6). In which control group was treated with Citrate buffer solution, the diabetic control group was treated with STZ and citrate buffer only, diabetic treated group was treated with different doses of test compound (150, 250mg/kg) and Pioglitazone as standard drug.

The whole plant extract of *Ocimum sanctum* has proclaimed to have antidiabetic activity because of its anti-oxidant and insulin potentiating activities. When compared to the diabetic control group, the diabetic treated group produce marked anti-diabetic activity. When compared to the diabetic treated group that receive Pioglitazone the diabetic treated group that receive 250mg/kg of extract have a significant anti-diabetic effect than the diabetic treated group that receive 150mg/kg of extract. Treatment with both doses of extract reduces the mortality rate and prolonged the survival of diabetic mice. The anti-diabetic effect of methanolic extract of *Ocimum sanctum* may be due to the presence of different types of phytoconstituents.

HEPATOPROTECTIVE ACTIVITY

1. Nirmala et al (2012)⁷ conducted a study on *Musa paradisiaca* for the evaluation of the hepatoprotective activity. This study shows that aqueous (500mg/kg) and alcoholic extract (250mg/kg & 500 mg/kg) of the stem of *Musa paradisiaca* offered significant protection against the CCl₄ induced hepatic damage by preventing the histological changes caused by CCl₄. *Musa paradisiaca* also scavenges free radicals responsible for CCl₄. The aqueous and alcoholic extract of stem of *Musa paradisiaca* also reduces the elevated serum enzyme level. The stem of *Musa paradisiaca* also shows antioxidant property which also contributes to hepatoprotective activity.

In case animals with CCl₄ induced hepatotoxicity, animals that receive alcoholic extract and CCl₄ at a dose 500mg/kg reduce SGPT, SGOT, ALP, Direct bilirubin and Total bilirubin when compared to animals that receive 250mg/kg of ethanol extract. Animals that receive aqueous extract at a dose of 500mg/kg showed a significant reduction in SGPT, SGOT, ALP, Direct bilirubin and total bilirubin when compared to animals that receive 250mg/kg of aqueous extract. Aqueous extract of 250mg/kg has not declined significantly the level of enzymes.

In the case of animals with paracetamol-induced hepatotoxicity animals treated with the alcoholic extract of *Musa paradisiaca* at a dose of 500mg/kg reduced SGOT, SGPT, ALP, Direct and total bilirubin significantly ($p < 0.001$) as compared to paracetamol intoxicated group. Aqueous extract of the stem at a dose of 500mg/kg reduced total bilirubin significantly with $p < 0.001$, as compared with paracetamol intoxicated group and SGPT significantly with $p < 0.01$ and SGOT, direct bilirubin with $p < 0.05$, as compared to paracetamol intoxicated group. But an aqueous extract of 250mg/kg has not decreased the level of serum enzymes considerably.

The histopathological study shows that normal liver show central vein and cords of hepatocytes, animals intoxicated with CCl₄ and Paracetamol show hepatocellular degeneration with fatty changes, Sylmarin treated group shows normal central vein with mild hepatocytic change. In CCl₄ intoxicated group animals treated with 250mg/kg of alcoholic extract show mild hepatocellular degeneration, animals treated with 500mg/kg show mild perilobular fatty changes degeneration and animals treated with 250mg/kg aqueous extract show high hepatocellular degeneration and 500mg/kg show dilated central vein with perilobular hepatocellular changes. In Paracetamol intoxicated group animals treated with 250mg/kg alcoholic extract show less fatty changes, animals treated with 500mg/kg alcoholic extract show normal central vein and animals treated with 250mg/kg aqueous extract show dilated central vein with less hepatic changes, animals treated with 500mg/kg show mild hepatocytes with fatty changes.

Thus we can infer that alcoholic extract (250 and 500mg/kg) and aqueous extract (500mg/kg) of the stem of *Musa paradisiaca* have remarkable hepatoprotective activity.

2. Akilavalli N et al (2011)⁸ conducted a study on albino rats for the evaluation of hepatoprotective activity of *Ocimum sanctum* by administering lead to induce toxicity. This

study shows that the elevated serum bilirubin levels due to lead-induced toxicity were restored to normal levels on treatment with aqueous extract of *Ocimum sanctum*. The aqueous extract of *Ocimum sanctum* leads to the regeneration of the hepatic tissues and improved hepatic efficiency. The blood samples treated with aqueous extract *Ocimum sanctum* showed:

- an increase in total protein content, restoration of AST, ALT & ALP levels
- Superoxide dismutase and glutathione reductase activity to normal levels produce a significant reduction in the lipid peroxidation levels.

The hepatoprotective activity of *Ocimum sanctum* may be attributed to the antioxidant activity of the plant.

CONCLUSION

This review presents a detailed review of the traditional uses of *Ocimum sanctum* and *Musa paradisiaca* in ulcer, diabetes and hepatic diseases. Indian medicinal plants and their derivatives are considered as appraisable sources of medicinal agents to treat a variety of ailments. Because they possess fewer side effects and considered as a better and safer approach for the management of various ailments.

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