

Cardioprotective properties of Neem, Peepal and Tulsi

Loveneet Kaur

Department of Botany & Environment Science, Mata Gujri College, Fatehgarh Sahib-140406,
Punjab

loveneet.bhangu@gmail.com

Abstract

Cardiovascular disease is the spectrum of diseases involving the heart and blood vessels, and the leading cause of mortality in the world. Medicinal plants have been used for thousands of years to treat cardiovascular diseases. In Traditional Persian Medicine, there is a special focus on heart diseases. In this paper, we will discuss medicinal properties of three important plants i.e. Neem, Peepal and Tulsi for combating cardiovascular diseases. Major bioactive compounds that are identified from these plants are also discussed. These plants can be rich sources for development of new and effective pharmaceuticals for the treatment of cardiovascular diseases.

Keywords: Cardiovascular, Diseases, Heal, Herbs, Medicinal Plants.

Tob Regul Sci.™ 2021;7(6): 6678-6685

DOI: doi.org/10.18001/TRS.7.6.140

Introduction

Cardiovascular diseases are the leading cause of death in world ¹. In 2012, an estimated 17.5 million people died due to CVDs. It represents 31% of all the global deaths ¹. The principle diseases between CVDs are: stroke (6,7 million deaths, of deaths of CVDs) and coronary heart disease (7.4 million deaths, of CVDs deaths)^{1, 2}. The prevalence of CVDs increase with age being 5% at the age of 20 years to 75% at the age of 75 years ³. CVDs can be prevented by mediating on behavioural risk factors: unhealthy diet and obesity, cigarette usage, poor eating habits and obesity, inactivity, and alcohol abuse. Others risk factors of CVDs are diabetes, hypertension, diabetes, hyperlipidaemia or already established disease¹. Diabetes mellitus and hypertension are increasing, being alarming public health problems ⁴. A high- glycaemic index affects the risk of CVDs ⁵. CVDs include: cerebrovascular disease, coronary heart disease, peripheral arterial disease, rheumatic heart disease and hypertension ³. The dietary factors plays an important role to protect coronary heart disease, such as antioxidants that are present in plants.

Since the beginning of time, humans have employed plants to treat a variety of illnesses. There are many pharmacological uses for plants, and 25000 diverse compounds are derived from various plant species by various scientists ⁶. In this review, we will discuss three very common plants i.e. Neem, Peepal and Tulsi, that are very useful in the prevention and treatment of cardiovascular diseases.

Significant reasons for a heart attack incorporate elevated cholesterol, blood clumps, arrhythmic heart activity and hypertension. Neem leaves diminished coagulating, brought down circulatory strain and awful cholesterol, impeded fast or strangely high heartbeat and repressed sporadic heart rhythms⁷.

The leaves of Peepal tree helps in the treatment of heart diseases.⁸ Tulsi has a beneficial effect in heart disease and the delicacy resulting from them. It decreases the level of blood cholesterol⁹.

Azadirachta indica

Common name: Neem

Classification

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Sapindales

Family: Meliaceae

Genus *Azadirachta*

Species *Azadirachta indica* – neem

Part used: Leaf, Whole plant

Botanical description

Azadirachta indica is a large evergreen plant. The height of plant is upto 20m. The leaves of Neem are alternate. The leaf have 8 to 19 leaflets. They may appear in the month of March - April. The taste of leaves is bitter¹⁰.



Fig. 1 Neem

Chemical composition of *Azadirachta indica*

The Neem leaves is known as storehouse of organic compounds. The leaves of Neem contains 0.13% of essential oil, that is responsible for the smell of Neem leaves¹¹. There are more than 140 active components that are isolated from different parts of Neem plants¹¹. The components are divided into two classes: isoprenoids and non isoprenoids¹². Isoprenoids includes triterpenoids, diterpenoids, vilasinin type of compounds¹³, C-secmeliacins, limonoids and its derivatives. Nonisoprenoids includes polysaccharides, proteins, sulphurous compounds,

dihydrochalone, polyphenolics such as flavonoids and their glycosides, coumarin and tannins and aliphatic compounds¹⁴.

Table 1. Principal components of Neem leaf¹⁵

s.no.	Components	Content
1.	Carbohydrates	47.46-51.2
2.	Crude fiber	11.20-23.80
3.	Crude protein	14.01-18.82
4.	Fat	2.31-6.93
5.	Moisture (g/100g)	59.49
6.	Ash	7.73-8.52
7.	Amino acids (mg/100g)	
8.	Tyrosine	31.5
9.	Alanine	6.4
10.	Glutamine	1.0
11.	Proline	4.0
12.	Aspartic acid	15.5
13.	Glutamic acid	73.3
14.	Minerals (mg/100g)	
15.	Calcium	3.4
16.	Phosphorus	0.13-0.24
17.	Iron	510.0
18.	Thiamine	80.0
19.	Vitamin C	0.04
20.	Niacin	17.1
21.	Carotene	1.4
22.	Calorific value (K cal/100g)	129.0

Role of *Azadirachta indica* in prevention of cardiovascular diseases

The extract of Neem tree is well known for cardioprotective properties. Extract of *Azadirachta indica* at dose of 250-1000 mg/kg effectively restores the most of hemodynamic, histopathological and biochemical parameters. A study concludes that the extract of Neem shows more cardioprotective activities as compared to vitamin E¹⁶.

Uses

Extract of *Azadirachta indica* at dose of 250-1000mg/kg effectively restore the most of hemodynamic, histopathological and biochemical parameters¹⁷.

Ficus religiosa

Common name: Peepal

Classification

Kingdom: Plantae

Division: Tracheophyta

Class: Magnoliopsida

Order: Urticales

Family: Moraceae

Genus: *Ficus*

Species: *religiosa*

Part used: Fruits, Leaves

Botanical description

The average life time is 900-1500 years. The height of tree is 33ft to 4990 ft. ¹⁸. The leaves are shiny, ovate having long petiole. Leaves are 10-17cm long, 8-12cm broad, bright green in colour with a petiole of 6-10cm.the bark is slightly covered, flat, thickness is 5 to8mm¹⁸.



Fig.2 Peepal

Chemical composition of *Ficus religiosa*

The fresh fruits have 62.4g/100g moisture content. The fruits are rich in micro and macro nutrients ⁸. Fresh fruits are good source of crude fibres and carbohydrates. It is a good source of proteins and fats. In fresh fruits, calcium is present in abundance ⁸.

Table 2. Chemical composition

S. No.	Constituents	Composition
	Moisture content	62.4g
	Fats	1.7g
	carbohydrates	21.2g
	proteins	2.5g
	Crude fibre	9.9g
	calcium	289mg
	Ash content	2.3g

Role of *Ficus religiosa* in prevention of cardiovascular diseases

Loveneet Kaur

Cardioprotective properties of Neem, Peepal and Tulsi

It is helpful in prevention of Heart disease. The Leaves are used for this purpose. Soak the leaves overnight and consume its extract three times a day has curable effect on cardiac problems⁸.

Uses

Soaking the leaves overnight and consuming its extract three times a day has curable effect on cardiac problems⁸.

Ocimum Tenuiflorum

Common name: Tulsi

Classification

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Lamiales

Family: Lamiaceae

Genus: *Ocimum*

Species: *tenuiflorum*

Part used: leaf, root, fruit, whole plant

Botanical description

The plant of *Ocimum tenuiflorum*, often called Holy Basil, Tulsi, or *Ocimum sanctum* is erect, branched and fragrant. The height of plant is about 30-60 cm when it matures. Simple, fragrant, opposite, oblong, elliptic, obtuse, or acute leaves with complete serrate, subserrate, or dentate margins are found in *Ocimum santcum*. Length of leaves is upto 5 cm^{19,20}. The flowers of Tulsi are small, purple to reddish in colour. Flowers are present in small clusters on spherical spikes. Stalkless bracts are present at the base of the each cluster of flowers. These bracts are heart shaped. Rarely, the flowers are longer than 5mm. the calyx tube is bearded outside near the base. The flower tube is hairy. The fruits are small in size. Seeds are yellow to reddish in colour²¹.



Fig.3 Tulsi

Chemical composition of *Ocimum tenuiflorum*

Twenty-six compounds, or 98.9% of the total oil contents, were described and identified using their mass spectra and relative retention indices as obtained on a non-polar stationary phase capillary column. The discovered chemicals are presented in Table 1 together with the percentage

content of each component and their retention index in the order that they eluted from the TG-5 column.

Methyl eugenol was determined to be the major component (82.9 percent). The other insignificant components were borneol (2.4 percent), germacrene D, and α -caryophyllene (4.1 percent). (2.3%) as well as β -copaene (1.9 percent). Derivative of phenyl (83.8 percent) Constituents represented the most common class of chemicals. Sesquiterpene hydrocarbons come next (11.1 percent), (3.1%) Oxygenated monoterpenes, monoterpene, monoterpene hydrocarbons (0.6%), oxygenated sesquiterpenes (3.1%), and oxygenated monoterpenes (0.3 percent)²² Joshi, 2014.

Numerous chemotypes and variable concentrations of the chemical methyl eugenol have been documented from various geographical locations,^{23, 24, 25} It's interesting to see that other substances have also been found in several chemotypes, as described by^{26, 27, 28, 29, 30, 31 and 32}.

Role of *Ocimum tenuiflorum* in prevention of Cardiovascular diseases

An experiment was conducted to search for the beneficial effects of *Ocimum tenuiflorum* in experimental Rats with pulmonary hypertension²⁰. The results of the experiment confirmed that *Ocimum tenuiflorum* (holy basil) at a dose 200mg per kg treatment improves the increased weight of lung to weight of body ratio and right ventricular hypertrophy. It was discovered that the treatment of *Ocimum tenuiflorum* reduced Nox-1 expression. It increases Bcl2/Bax ratio expression²⁰. The study clarify that the *Ocimum tenuiflorum* has therapeutic capability against the pulmonary hypertension in rats that are attributed to their antioxidant effects³³. Effect of Tulsi leaf methanolic extract on myocardial infarction caused by isoproterenol inflammation was examined in rats. Isoproterenol induce the myocardial infarction and increase the cardiac maker's level and phospholipid content²⁰.

However, it was reduced on pre - treatment with the extract of leaves of Tulsi. Rats treated with isoproterenol had increased cyclooxygenase-2 and 5-lipoxygenase activity, as well as levels of thromboxane B2 and leukotriene B4, that were decreased in extract pretreated rats. The study based on the results show that the cardioprotective effect of *Ocimum tenuiflorum* is may be due to high phenolic content of the methanolic extract of the leaves³⁴.

Moreover, An experiment was conducted to search for the beneficial properties of *Tulsi* sin experiment with CVD's in rats. The results of the experiment confirmed that *Ocimum tenuiflorum* (holy basil) at a dose 200mg per kg treatment improves the increased weight of lung to weight of body ratio and right ventricular hypertrophy³⁴.

Conclusion

Cardiovascular disorders are one of the leading causes of death in the world that leads to social and economic burden. The role of chemical compounds isolated from plants in management of cardiovascular diseases is a boon in the current era. In this review, we will discuss three very common plants i.e. Neem, Peepal and Tulsi, that are very useful in the prevention and treatment of cardiovascular diseases. More in vitro studies are needed to fully understand the

mechanism of action of extracts of these therapeutic plants in cardiovascular disorders, even though the studies that were included in this systematic review shed light on the cardio protective properties of these three medicinal plants, namely Neem, Peepal and Tulsi.

References

1. Anonomous. Cardiovascular diseases (CVDs), Key Facts Sheet. 2015.
2. Ness AR, Powles JW. Fruit and vegetables, and cardiovascular disease: a review. *International Journal of epidemiology*. 1997;26(1):1-13.
3. Mota AH. A review of medicinal plants used in therapy of cardiovascular diseases. *Int J Pharmacogn Phytochem Res*. 2016;8(4):572-591.
4. Bloomfield GS, Wang TY, Boulware LE, et al. Implementation of management strategies for diabetes and hypertension: from local to global health in cardiovascular diseases. *Global heart*. 2015;10(1):31-38.
5. Ludwig DS. The glycemic index: physiological mechanisms relating to obesity, diabetes, and cardiovascular disease. *Jama*. 2002;287(18):2414-2423.
6. Kamalpreet LK, Singh A, Kaur J, et al. A brief review of remedial uses of *Saussurea lappa*. *Journal of Pharmacognosy and Phytochemistry*. 2019;8(3):4423-4430.
7. Giri RP, Gangawane AK, Giri SG. Neem the wonder herb: a short review. *International Journal of Trend in Scientific Research Development*. 2019;3(3):962-966.
8. Kumar A, Sandeep D, Tomer V, et al. *Ficus religiosa*: A wholesome medicinal tree. *Journal of Pharmacognosy and Phytochemistry*. 2018;7(4):32-37.
9. Sethi J, Sood S, Seth S, et al. Evaluation of hypoglycemic and antioxidant effect of *Ocimum tenuiflorum*. *Indian Journal of Clinical Biochemistry*. 2004;19(2):152-155.
10. Subapriya R, Nagini S. Medicinal properties of neem leaves: a review. *Current Medicinal Chemistry-Anti-Cancer Agents*. 2005;5(2):149-156.
11. Puri HS. *Neem: the divine tree Azadirachta indica*: CRC Press 1999.
12. Atal CK, Kapur B. *Cultivation and utilization of medicinal plants*. 1982.
13. Devakumar C, Dev S. *Chemistry. Neem Research Development*. 1993:63-96.
14. Akhila A, Rani K. Chemistry of the neem tree (*Azadirachta indica* A. Juss.). *Fortschritte der Chemie Organischer Naturstoffe/Progress in the chemistry of organic natural products*. 1999:47-149.
15. Brahmachari G. *Neem—an omnipotent plant: a retrospection*. *Global heart*. 2004;5(4):408-421.
16. Peer PA, Trivedi PC, Nigade PB, et al. Cardioprotective effect of *Azadirachta indica* A. Juss. on isoprenaline induced myocardial infarction in rats. *International journal of cardiology*. 2008;126(1):123-126.
17. Rahmani A, Almatroudi A, Alrumaihi F, et al. Pharmacological and therapeutic potential of neem (*Azadirachta indica*). *Pharmacognosy Reviews*. 2018;12(24):250-255.
18. Sharma V, Mishra S, Yesudas R, et al. A Review on *Ficus religiosa* (Sacred Fig).
19. Joseph B, Nair VM. *Ocimum tenuiflorum* Linn.(Holy basil): pharmacology behind its anti-cancerous effect. *Int J Pharm Bio Sci*. 2013;4(2):556-575.
20. Sah, AK, Vijaysimha M, et al. *The Tulsi, Queen of Green Medicines: Biochemistry and Pathophysiology—A Review*. 2018.
21. Buddhadev SG, Buddhadev SS, Mehta ND. A review article on *Ocimum Tenuiflorum* Linn. *Int Peer Revd Ayur J*. 2014;2(2):1-6.

22. Joshi R, Hoti S. Chemical composition of the essential oil of *Ocimum tenuiflorum* L.(Krishna Tulsi) from North West Karnataka, India. *Plant Science Today*. 2014;1(3):99-102.
23. Kothari S, Bhattacharya A, Ramesh S, et al. Volatile constituents in oil from different plant parts of methyl eugenol-rich *Ocimum tenuiflorum* Lf (syn. *O. sanctum* L.) grown in South India. *Journal of Essential Oil Research*. 2005;17(6):656-658.
24. Awasthi P, Dixit S. Chemical Compositions of *Ocimum sanctum* Shyama and *Ocimum sanctum* Rama Oils from the Plains of Northern India. *Journal of essential oil bearing plants*. 2007;10(4):292-296.
25. Gbolade A, Lockwood Gs. Toxicity of *Ocimum sanctum* L. essential oil to *Aedes aegypti* larvae and its chemical composition. 2008;11(2):148-153.
26. Peer PA, Trivedi PC, Nigade PB, et al. Cardioprotective effect of *Azadirachta indica* A. Juss. on isoprenaline induced myocardial infarction in rats. *International journal of cardiology*. 2008;126(1):123-126.
27. Khan A, Ahmad A, Akhtar F, et al. *Ocimum sanctum* essential oil and its active principles exert their antifungal activity by disrupting ergosterol biosynthesis and membrane integrity. *Research in microbiology*. 2010;161(10):816-823.
28. Kicel A, Kurowska A, Kalemba D. Composition of the essential oil of *Ocimum sanctum* L. grown in Poland during vegetation. *Journal of Essential Oil Research*. 2005;17(2):217-219.
29. Yanpallewar S, Rai S, Kumar M, et al. Evaluation of antioxidant and neuroprotective effect of *Ocimum sanctum* on transient cerebral ischemia and long-term cerebral hypoperfusion. *Pharmacology Biochemistry Behavior*. 2004;79(1):155-164.
30. Machado MIL, de Vasconcelos Silva MG, Matos FJA, et al. Volatile constituents from leaves and inflorescence oil of *Ocimum tenuiflorum* L. f.(syn. *O. sanctum* L.) grown in Northeastern Brazil. *Journal of Essential Oil Research*. 1999;11(3):324-326.
31. Brophy JJ, Goldsack RJ, Clarkson JR. The essential oil of *Ocimum tenuiflorum* L.(Lamiaceae) growing in Northern Australia. *Journal of Essential Oil Research*. 1993;5(4):459-461.
32. Pino JA, Rosado A, Rodriguez M, et al. Composition of the essential oil of *Ocimum tenuiflorum* L. grown in Cuba. *Journal of Essential Oil Research*. 1998;10(4):437-438.
33. Meghwani H, Prabhakar P, Mohammed SA, et al. Beneficial effect of *Ocimum sanctum* (Linn) against monocrotaline-induced pulmonary hypertension in rats. *Medicines*. 2018;5(2):34.
34. Kavitha S, John F, Indira M. Amelioration of inflammation by phenolic rich methanolic extract of *Ocimum sanctum* Linn. leaves in isoproterenol induced myocardial infarction. 2015.