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RESEARCH ARTICLE

HOLY BASIL: AN AYURVEDIC GRATUITY

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ABSTRACT

Ocimum sanctum is a tiny, branched, and fragrant herb that is also referred to as "*Tulsi*" or "Holy basil." It stands about 70 cm tall. This fragrant plant is grown often close to Hindu homes and temples and is found all across India. The Ayurvedic and Siddha systems of medicine have employed all of this herb's components, including the roots, leaves, and seeds, for thousands of years to treat a variety of illnesses and problems. Due to the abundance of beneficial nutrients and different physiologically active substances, it is quite complicated chemically. With a high degree of safety, several scientific investigations have demonstrated that it has antioxidant, anti-stress, hepatoprotective, immunomodulatory, anti-inflammatory, antimalarial, antiviral, antibacterial, antifungal, and hypolipidemic activities. *Tulsi* is referred to as "The matchless one" in Ayurveda and is used either alone or in combination with other herbs to cure chronic cough, cold, fever, bronchitis, and many other common illnesses. This review's objective is to give a succinct summary of the vast body of research on the pharmacology, phyto-chemistry, and many health advantages of *tulsi*. The World Health Organization (WHO) has pushed for the assessment of plants' medicinal potential for conditions for which we lack effective allopathic medications. This plant is a member of the Lamiaceae family, which is indigenous to the Old-World tropics and is used for both medical and religious purposes. The plant has been given many medical benefits not just in Ayurveda and Siddha but also in Greek, Roman, and Unani traditions. It is well-known as a medicinal plant and herbal tea in South Asia. Eugenol, cardinene, cubenol, borneol, linoleic acid, linolenic acid, oleic acid, palmitric acid, steric acid, Vallinin, Vicenin, Vitexin, Vallinin acid, Orientin, Circineol, Gallic Acid, vitamin A, vitamin C, phosphorus, and iron are among the chemical components isolated from various parts of the plant. *Ocimum sanctum* has been demonstrated to have a wide range of therapeutic qualities, including analgesic, anti-ulcer, immune-modulatory, anti-asthmatic, anticancer, anticonvulsant, antidiabetic, antihyperlipidemic, antistress, as well as beneficial memory enhancer and neuroprotectivepotential.

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INTRODUCTION

One of the most well-known alternative and complementary medical systems is Ayurveda, a system of ancient Hindu medicine that is indigenous to India. Hindu legend attributes the development of ayurvedic medicine to Dhanvantari, the divine doctor. Ayurveda traces its roots back to the Vedas, notably Atharvaveda, and emphasises the use of locally available plant-based remedies to heal illnesses (Patwardhan*etal*., 2005). *Ocimum sanctum*, usually referred to as *tulsi* or Holy basil, is a fragrant plant that is a member of the Lamiaceae family. It is frequently employed as medication to treat various illnesses (Borah *et al*., 2018). Nowadays, a significant portion of the pharmaceuticals that are used come from plants, such as morphine from Papaversomniferum, aswagandha from Withaniasomnifera, ephedrine from Ephedra vulgaris, atropine from Atropa belladonna, and reserpine from Roulphiaserpentina, among others.

The therapeutically significant essential oils and secondary metabolites found in medicinal plants are abundant. In addition to being cost-effective, safe, and readily available, medicinal plants are said to provide substantial benefits for treating a variety of diseases (Atal,*et al*., 1989; Siddiqui, 1993).These benefits have led to a widespread use of medicinal plants in daily practise by practitioners of traditional medicine. A World Health Organization (WHO) survey conducted in 1993 found that about 80% of patients in India, 85% of patients in Burma, and 90% of patients in Bangladesh are treated by practitioners of traditional systems of medicine (Siddiqui, 1993; WHO, 1993). Ancient literature describes the "Queen of herbs" *tulsi* as a holy and healing plant. It serves as a significant representation of Hindu religious tradition. Sanskrit is the origin of the name *tulsi*, which translates to "unmatched one" (Ghosh*et al.,* 1995). The one who pleases Lord Vishnu is what its other name, Vishnupriya, denotes. This plant is a member of the Labiatae family, which is distinguished by a square stem and distinctive perfume. *Tulsi*'s

botanical name is *Ocimum sanctum (Linn)*. The plant is cultivated all across India, from the Andaman and Nicobar Islands to the Himalayas at heights of up to 1800 metres (Wealth of India, 1991). Additionally, it is widely distributed throughout West Africa, Australia, Malaysia, and certain Arab nations. The dominant species in the genus is *Ocimum sanctum (Linn)*. The plant's leaves are extremely revered and frequently function as a constant component of Hindu religious rites (Tirtha or Prasada). *Ocimum sanctum* comes in two colours, black (Krishna *tulsi*) and green (Rama *tulsi*), and their chemical make-up is comparable.

HISTORICAL BACKGROUND

The plant (*Tulsi*), in accordance with Indian mythology, originated as an avatar of the Hindu goddess *tulsi*. In its botanical form, *tulsi* is adored by the gods Shiva and Brahma and is a favourite plant of Vishnu, Krishna, and Ram. *Tulsi* promotes love, compassion, trust, and dedication while opening the heart and mind. Today, it is revered and meticulously produced by the traditional Hindu households, and it is widely utilised and included in religious rites and significant celebrations throughout the subcontinent (Miller *et al.,* 2003). *Tulsi* has reportedly been used therapeutically from 400–500 BC, according to literature. This was first mentioned in the Rigveda (3500–1600 BC).

There are two varieties of *Ocimum sanctumL.* (*Tulsi*) that may be cultivated.

Sri *tulsi*- *Tulsi* plants with green leaves and

Krishna *tulsi*- *Tulsi* plants with purple leaves (Prakash*et al*., 2005).

MORPHOLOGY

Tulsi, a member of the Labiatae family and a fragrant plant native to the tropics of the Eastern Hemisphere, is also a common weed and cultivar. The herb is an upright subshrub with several branches. The green and purple leaf varieties of *tulsi*, which are mostly grown in India and Nepal, are two significant morphotypes. *Tulsi*'s root, seed, stem, and other components are utilised in medicine, although fresh and dried leaves are the most used parts (Krishna, 2014; Sen, 1993; Khanna*et al*., 2003; Mandal, 1993).The morphological details given in Table 1 and Taxonomy of *tulsi* given in the Table 2.

BOTANICAL DESCRIPTION

It is a fragrant, upright, heavily branched plant that grows to a mature height of between 30 and 60 cm. Simple, opposite, elliptic, oblong, obtuse or acute, with whole or sub serrate or dentate edges, and growing up to 5 cm long is the characteristics of its fragrant leaves. The tiny, purple to scarlet blooms of *tulsi* grow in tight clusters on cylinder-shaped spikes. At the foot of each flower cluster are heart-shaped bracts lacking a stalk. In the sepal cup, there are no hairs. Flowers seldom exceed 5 mm in length, and the base of the calyx tube is bearded; and hairy flower tube. The fruits are tiny, and the colour of the seeds ranges from yellow to reddish.Formulations from *tulsi*and their details given in Table 3.

Other Species of *Tulsi*: Ocimumcanum (Ram *tulsi* or Kali*tulsi*), Ocimumbasilicum, OcimumKilmand, Ocimumscharicum and Ocimum Sanctum.

MEDICINAL AND PHARMACOLOGICAL PROPERTIES

Anti-stress activity: Stress is a relatively prevalent condition from which the majority of people suffer often (Singh *et al.,* 2016). It is defined as psychological, physiological, and behavioural reactions that people exhibit when there is an imbalance between their deficiencies and their capacity to address those shortfalls (Edwin *et al.,* 2016). Lack of neurotransmitters including dopamine, norepinephrine, and serotonin causes stress reactions. According to earlier research, *Ocimum sanctum* leaves increase serotonin levels in the brain, which has a protective effect against stress activities (Samson *et al.,* 2006). *Tulsi* is a powerful plant that has relaxing properties, especially when taken twice daily (Sen*et al.,* 1992). *Tulsi* leaf extraction reduces both acute and long-term noise stress, which is induced by the plasma level of the stress hormone cortisol (Singh *et al.,* 2016). And carrying out the trial on animals or doing animal studies has proven this impact. High levels of stress have a detrimental effect on the body and increase the risk of a number of ailments, including psychiatric disorders, immune system suppression, peptic ulcers, hypertension, and ulcerative colitis; as a result, treatment is very important. Physical or physiological effects of stress are possible. *Tulsi* decreases hypoxia while simultaneously increasing survival duration under anoxic stress and memory capacity (Bhargava*et al.,* 1981; Marc *et al.,* 2014).There are different kinds of stress like:

Table 1: Morphological details of *tulsi*

S.No.	Particulars	Details
1	Height	30-75 cm.
2	Stems	Hairy
3	Leaves	With a petiole, the leaves are green, ovate or oblong, 5 cm long, slightly toothed, acute, with an entire or serrated margin, pubescent on both sides, and minutely gland-dotted. Strong odour and aromatic flavour with a faintly pungent taste.
4	Flowers	Purplish in elongate racemes in close whorls
5	Seeds	Reddish black.
6	Nutlets	Pale brown or red and slightly compressed.

Table 2: Taxonomy of *Tulsi*

S. No.	Kingdom	Plantae
1.	Subkingdom	Tracheobionta
2.	Superdivision	Spermatophyta
3.	Division	Magnoliophyta
4.	Class	Magnoliopsida
5.	Subclass	Asteridae
6.	Order	Lamiales
7.	Family	Lamiaceae
8.	Genus	Ocimum
9.	Species	*O. sanctum*

S. No.	Product Name	Details	References
1	***Tulsi* Tea**	*Tulsi* leaves should be washed and ground into a pulp. Add a cup of water to this pulp and stir. Add the right amount of powdered dried ginger, cardamom seeds, and pepper roots to the mixture to season it (*piper longum*). Boil, and then stir in a tablespoon of sugar. While it's still hot, consume this concoction. Decoction should not be strained. After consuming the decoction, chew and ingest the cooked *tulsi* leaf pulp. Take this mixture each morning. This concoction is said to be able to treat a number of illnesses, increase appetite, and give one a feeling of vigour and freshness. Alternately, 250 g of water and 10 g of *tulsi* leaves are cooked together until only half or one-fourth of the water is left. Approx. 20 to 25 g of crystal sugar is dissolved in an equivalent amount of milk, with the amount being adjusted as necessary. This method of preparing *tulsi* tea makes it not only a tasty beverage but also a potent treatment for a number of ailments, including excess *vata* and *pitta*, colds, fevers, lack of appetite, lassitude, burning in the stomach, etc. Another type of *tulsi* tea is produced by boiling 10 g or more of *tulsi* leaves in 250 g of water until half or a quarter of the water has been boiled away. This tea is very effective in treating conditions like fevers, a dislike of exertion, lassitude, lack of appetite, stomach burning, and conditions brought on by an excess of *vata* (vayu) and *pitta*.	Biswas,*et al*.(2005); Rai,*et al*.(1997); Jyoti,*et al*.(2005)
2	**Cold extract of *Tulsi***	Five to seven *tulsi* leaves and three to four black pepper seeds should be ground together in a mortar with a little water until a homogenous, thick liquid is produced. Every morning, on an empty stomach, sipping a glass of this ice-cold *tulsi* extract calms and fortifies the brain by taking the heat out of it. Additionally, this beverage strengthens and stimulates the heart. In the colder months, the beverage is more appealing. Almonds enhance the beverage's quality and make it healthier.	
3	**Vegetable soup:**	Four bundles of onion saplings were cleaned and the leaves were removed and chopped into little bits. Keep these additional components prepared. three cups of water; celery leaves chopped into small bits; one cup of diced carrots; one cup of peeled and chopped tomatoes (of the larger kind); one small piece of capsicum; and salt and pepper to taste Some neem leaves, one teaspoon each of ajwan seeds, *tulsi*, and oregano. **Method of preparation:** In a little oil, fry the onion and pepper pieces. The other ingredients are then added, and the dish is finished cooking. Cook a cup of phanasi or other beans, crush them, and add the paste to the soup if thickening is needed. One-fourth of a cup of rice should be added to the broth and heated through.	
4	**A nutritious sweet (*pak*) prepared from *Tulsi* seeds**	*Tulsi* seeds are widely employed in the creation of foods, medications, essences, fragrances, antiseptics, and other products. Compared to Ram *tulsi*, Shyam*tulsi* seeds are said to have more therapeutic benefits. The term "maanjars" (derived from the word "manjari," which means inflorescences), refers to the flower clusters, or inflorescences, of t*ulsi* plants. These blossoms produce the seeds, which shake out of the dried maanjars when shaken. Ram *tulsi* produces more seeds. The seeds resemble mustard seeds in colour and are the size of poppy seeds. Around October, during the month of Ashvin, a large number of seeds are generated. These seeds may be used to make a "*pak*," or medicinal sweet, which is nourishing and gives the body power. **Preparation:** *Tulsi* seeds should be ground or pounded to a fine flour-like powder. Keep the following items on hand before starting the recipe:- Black pepper seeds- 10 grams (g), cannabis - 5 g, saffron - 2 g, almond seeds - 125 g,*khova*(khoya), Bengal gram flour - 125 g, crystal sugar - 250 g, and ghee (clarified butter) - 250 g make up the 125 g of *tulsi* seed flour. Mix the gramme flour with the majority of the ghee. Add a little of milk to the flour. Put the remaining ghee in a pan made of iron or brass and heat it up. Add the gramme flour to the ghee when it's about to get hot, and cook the mixture on a low heat. When the flour is almost done, break it up into little lumps, combine it with the gramme flour, and fry them together until they are both fully cooked and starting to turn brown. The almond seeds have been added, chopped into little bits, and cooked for a while. After adding the t*ulsi* seed flour and mixing well, add the cardamom, pepper, and cannabis powders to your taste. Then remove the pan from the heat. Prepare thick syrup with sugar in the meantime and flavour it with saffron. The syrup's consistency needs to be changed to accommodate the weather. In monsoon, the syrup's thickness (or consistency) should ideally be a little bit larger since otherwise, the sweet is more likely to decay quickly and become mushy from the moisture in the air. Thicker syrup also produces better results. On the other hand, the syrup shouldn't be prepared to be as thick and viscous in the winter because thicker syrup increases the hardness of the sweet. A little thinner syrup will be required if it is wished to enhance the amount of ghee in the sweet in order to boost its nutritional value. Once the syrup has reached the right consistency and the saffron has been added, continuously whisk in the toasted flours. The dessert is now ready. While it's still hot, spread it out on a flat dish and let it cool. Cut it into the appropriate shape and size of pieces once it has dried. Every morning should be the time to take this *pak*. You can have 20 to 100 g of the sweet each day, depending on your constitution Following the treat, drink 200 to 250 g of milk. During the time when this *pak* is regularly consumed, it would be best to avoid adding any oil, chilies, tamarind, spicy spices, and similar additives to one's food, or at the least, minimise their proportion in the daily diet. This will enable the *pak's* full physiological impact. **Benefits:** *Tulsi* seeds are said to be very nourishing and considerably strengthen the body in Ayurveda. The body's component that controls virility and strength is strengthened, and semen secretion rises as a result. Numerous illnesses brought on by *vata* (vayu) and kapha are curable. Improvements in digestion efficiency. By consuming this sweet on a daily basis, you may treat a wide range of ailments, such as digestive problems, illnesses brought on by excessive *vata*, wounds, brain deterioration, persistent colds, coughs, debility and dyspepsia.	

Continue ……

5	**Refreshing drink**	Fill a teapot with one cup of boiling water. Include two pieces of lemon grass (green tea), 12 to 15 mint leaves, and 12 to 15 *tulsi* leaves. After 15 minutes, strain the mixture. Honey and lemon juice can be added to enhance the flavour. Each morning, consume this concoction on an empty stomach. It promotes healthy digestion, cleans the blood, and makes you feel revitalised. Lemon juice is utilised to lessen the damage brought on by an excess of bile, while honey is used to slim down. The addition of some ginger will benefit the mixture. **Chemical Constituents:** The different parts of *Ocimum sanctum* contain diverse types of constituents in variable amounts. The leaves contain a high contented of essential oils which include Toluene. Camphene, Octane, Benzene, Citronellel, Sabinene, Limonene, Ledol, Dimethylbenzene, Ethyl-2- methyl butyrate, Eugenol, Terpiniolene, β-elemene, Isocaryophyllene, Iso-eugenol, α-amorphene, α-guaiene, α-humulene, α-terpineol, Borneol, Calamine, Nerolidol, Carvacrol, Geraniol, Humulene oxide, Elemol, Tetra decanal, (EZ)-famesol, Cissesquisainenehydrate, α-bisbolol, 14-hydroxy-α-humulene. To separate constituents' extraction is performed in numerous ways. When leaves and aerial parts of plants were extracted with alcohol, several compounds were discovered to be present: Luteolin, Orientin, Urosolicacid, Apigenin7-Oglucuronide, Luteolin-7-O-glucuronide, Isorientin, Aesculin, Triacontanolferulate, Vallinin acid, Gallic acid, Circineol, Aesculetin, Triacontanolferulate, Chlogenic acid, Stigma Fresh leaves and stems might be extracted to produce phenolic substances such apigenin, circimaritin, isothymusin, eugenol, and rosameric acid. Additionally, monoterpenes and sesquiterpenes including neral and camphene are found in *O. sanctum.*stigma sterol and cholesterol. This plant contains vitamins A and C as well, which increase the formation of antibodies by 20% and offer disease prevention.	
6	***Tulsi* used as Traditional Indian Ayurvedic Medicine**	One of the characteristics that make the *tulsi* plant such an effective medical herb, according to Organic India, an organisation devoted to organic agriculture and sustainable development, is its capacity to lessen stress. *Tulsi* is rich in antioxidants and essential oils that are extremely helpful at lessening the negative effects of stress on the body. *Tulsi* has many different medicinal qualities. Despite being primarily utilised by Hindus or Indians, it is now being used by others who are aware of its enormous medicinal benefits. The ability to operate as an adaptogen is a trait of *tulsi*. It helps the bodies many functions run in harmony and is very effective in reducing stress. *Tulsi* extracts have been employed in the conventional Ayurvedic medical system in India. Additionally, the Unani medical system makes use of it. *Tulsi* is used in Ayurvedic treatments for cataracts, malaria, heart disease, poisoning, inflammation, headaches, and stomach issues. The *tulsi* enhances the nerve system by acting on it. It makes the heart stronger. Additionally, to serving as an appetiser, it aids with digestion. It promotes the release of digestive enzymes and lessens gas. The *tulsi* cleanses blood of any impurities that may be present thanks to its detoxifying capabilities. *Tulsi* could protect against radiation poisoning. *Tulsi* may potentially have anti-cancer effects, according to certain reports. It has become common knowledge that ingesting a *tulsi* leaf daily will provide cancer prevention. Apart from its religious significance it is of great medicinal significance, and is a prime herb in Ayurvedic treatment. Marked by own strong aroma and rigorous standards smell, *tusli* is a kind of "the elixir of life" as it promotes longevity. Many diseases and common maladies, including the common cold, headaches, stomach problems, inflammation, heart disease, different types of poisoning, and malaria, can be prevented and treated with the plant's extracts. The karpoora*tulsi* plant yields an essential oil that is mostly used in medicine, however lately it has also been utilised to make herbal toiletries. The *tulsi* plant has been applied topically for skin diseases like eczema, ringworm, and bug bites in Ayurvedic medicine, according to the Plant Cultures project of the Medicines and Healthcare Products Regulatory Agency (MHRA) of the United Kingdom. It is frequently used as a prophylactic antibacterial for infections as well as to lower fevers, improves digestion and lung problems, lessen the symptoms of colds, and remove toxins and poisons.	
7	***Tulsi* in Modern Medicine**	Studies in contemporary medicine suggest that *tulsi* may be useful in treating illnesses including ulcers, high cholesterol, Type 2 diabetes, obesity, and weakened/suppressed immune systems (from conditions like cancers and AIDS). The traditional uses of *tulsi* in Ayurveda may be attributed to some inherent qualities in many varieties of *tulsi*, such as the essential oils containing the anti-inflammatory compound eugenol and various acids with antioxidant and anti-inflammatory properties that could support the claims of t*ulsi* being a treatment for so many conditions, according to Ayurveda. In your house, you may use *tulsi* to prepare a great cup of tea or, like other herbs, to improve the flavour of your dishes. This sub-shrub is not toxic to animals, rather simple to cultivate, and looks quite lovely in a decorative pot. Even without its therapeutic benefits, the *tulsi* plant may be a wonderful addition to your home, either in your garden or spice rack. Western medicine and diabetes: Diabeteshealth.com reports that researchers believe holy basil (*tulsi*) leaves may promote insulin output by enhancing pancreatic beta cell activity. According to the website, a tiny research study of people with type 2 diabetes revealed that those who consumed 2.5 g of powdered *tulsi* had lower blood glucose fasting levels than those who consumed a placebo. *Tulsi* has not been associated with any pharmacological interactions, according to Diabeteshealth.com, although certain interactions may occur in those who use insulin or insulin secretagogues like sulfonylurea (glyburide, glipizide, Amaryl), Prandin, or Starlix. As a result, diabetics who are considering utilising *tulsi* should first speak with their doctors.	
	Natural Medicinal Uses-:	*Tulsi* is used in Sidha, Unani, and Ayurvedic medicine to cure many different skin diseases, fevers, coughs, and internal illnesses. Indians use a liquid tonic made from *tulsi* plants and cardamom or lemon juice to cure bronchitis using ayurvedic medicine. All three of these ancient medical systems are centred on all-natural cures and treatments, mostly using plants and herbs.	
8	**Health benefits of *tulsi* in our daily life**	The *tulsi* herb provides a wide range of therapeutic benefits. The leaves strengthen the nerves and improve memory. They encourage clearing the bronchial tube of phlegm and catarrhal matter. The leaves make the stomach stronger and cause excessive sweating. The plant's seeds are mucilaginous. Common Cold and Fever: Many fevers can be treated with basil leaves. Tender leaves cooked with tea can prevent malaria and dengue fever during the rainy season when these infections are quite common. A decoction of the leaves cooked with powdered cardamom in half a litre of water, combined with sugar and milk, lowers the temperature in cases of acute fevers. You may use the juice from *tulsi* plants to reduce fever. Extract of *tulsi* leaves in fresh water should be given every 2-3hrs.	
9	**Respiratory Disorders**	*Tulsi* is a key ingredient in several Ayurvedic expectorants and cough syrups. In bronchitis and asthma, it aids in the mobilisation of mucus. *Tulsi* leaves can be chewed to treat colds and flu When you have a sore throat, you can drink water that has been boiled with basil leaves. You can gargle with this water. The herb can be used to treat respiratory system issues. Bronchitis, asthma, influenza, cough, and cold can all be treated with a decoction of the leaves made with honey and ginger. In the event of influenza, a decoction made from the leaves, cloves, and table salt also provides quick relief. They must be cooked in half a litre of water until only half the water remains, and then added, before being consumed.	Kothari *et.al.*(2008); Staples *et.al.*(1999); Kuhn *et.al.*(2007); Puri*et al.*(2002); Biswas and Biswas, 2001; Jyoti*et.al.*(2004); Devi *et al.*(1999);Bano*et al.*(2017)
10	**Kidney Stone**	The kidney is strengthened by basil's effects. If taken regularly for six months, basil leaf juice and honey can help remove kidney stones through the urinary system.	
11	**Heart Disorders**	The kidney is strengthened by basil's effects. If taken regularly for six months, basil leaf juice and honey can help remove kidney stones through the urinary system.	
12	**Children's Ailments**	The juice of basil leaves is effective in treating common paediatric issues like fever, diarrhoea, and vomiting. Basil leaves combined with saffron helps speed up the emergence of chicken pox pustules if they are slow to form	
13	**Stress and Headaches**	Basil leaves are thought to be an "adaptogen" or stress-relieving substance. Recent research has demonstrated that the leaves offer important stress protection. Even healthy people can reduce stress by chewing 12 basil leaves twice daily. It helps avoid certain common elements while purifying blood. The herb basil is effective as a headache remedy. For this disease, the leaves can be administered as a decoction. You may also apply a paste made from pounded leaves and sandalwood on the forehead to relieve heat, headaches, and overall discomfort by cooling it down.	

Toxicant stress: It reduces the effect of heavy metals, radiation, and chemical substances. It has been demonstrated via laboratory investigations that *tulsi* has the power to stop the harmful effects that harm cells, the immune system, and genetic material. *Tulsi* protects against a wide range of pharmaceuticals, heavy metals, and industrial toxins, as well as radiation's hazardous effects (Joseph *et al.,* 2011). Holy basil eliminates free radicals and lessens radiation-induced oxidative cellular and chromosomal damage (Uma *et al.,* 2000; Reshma*et al.,* 2011; Bhartiya*et al.,* 2010; Monga*et al.,* 2011). Reduced organ damage and increased post-radiation survival in experimental animals will come next (Uma *et al*., 1999; Nayak*et al*., 2005; Samson *et al*., 2007).

Physical stress: Physical stress is caused by the toxicity of chemicals and radiation and includes things like loud noises, strenuous physical activity, and extreme cold in addition to amplifying physiological and metabolic stress. The effects of *tulsi* include an increase in aerobic metabolism, a reduction in damaging oxidative stress, and maintenance of physiological biochemical parameters impacted by physical stress (Joseph *et al.,* 2011). Previous research has suggested that oxidative stress can harm cells and tissues(Suryawanshi*et al*., 2015).

Mental stress: In addition to toxins, diseases, and contemporary living, a high degree of physiological stress was brought on by the high demands and quick speed of modern life. *Tulsi* normalises to a tranquil mind by removing toxins from the body's cells and organs (Joseph *et al*., 2011).

Anti- Alzheimer's activity: A neurological condition called Alzheimer's mostly results in behavioural abnormalities, cognitive decline, and mood swings (Raghavendra*et al.,* 2011). Usually, dementia is a factor in AD; globally, between 17 and 25 million individuals are affected by dementia, which affects around 70% of industrialised nations (Parnetti*et al.,* 1997; Geldmacher*et al.,* 1997; Cummings *et al.,* 1997). There is no perfect cure for AD, however medication can lessen some of its symptoms and restore cholinergic function (Max *et al.,* 1999; Byrne 1998; Christie *et al.,* 1981). Drugs like memantine and donepezil worsen cognitive impairment in AD patients, and two clinical trials have shown no improvement in memory, according to the literature. As a result, nootropic herbal medicines can increase the effectiveness of another anti-therapy (Feldman *et al*., 2004; Sallowa*yet al*., 2004; Courtney *et al*., 2004). Meanwhile, oxidative stress is also another main content which is involved in the AD by stimulation of neuronal death (Paris *et al*., 1998; Smith *etal*., 1996; Nunomura*et al*., 1979). The majority of nootropic medications have an antioxidant action that prevents Alzheimer's disease(Kennedy *et al*., 2006; Frank and Gupta, 2005). The primary component of *tulsi*, eugenol, as well as some of the other secondary components, such as fixed oils and flavones, which have pharmacological properties, all have antioxidant activity (Uma *et al.,* 2000). One of *O. bascilicum's* main active ingredients, eugenol, is what gives *tulsi* its therapeutic effects (Devi *et al.,* 1999; Prakash*et al.,* 2005; Singh *et al.,* 2007). Additionally, a standardised *tulsi* extract statistically reduced oxidative stress and ischemia reperfusion-induced increased cognitive impairment in rodents (Yanpallewar *et al.,* 2004; Yanpallewar*et al.,* 2005). In models of cerebro-degeneration, holy basil displays antioxidant and memory-enhancing properties. As was already noted, cognitive decline and oxidative stress are also linked to AD. This is why the effectiveness of *tulsi* in treating AD was evaluated using models of neurotoxins like Ibotenic acid and colchicine. Ibotenic acid is a structural analogue of glutamate that activates glutamate receptors through excitotoxicity to cause neuronal necrosis. Ibotenic acid injections impair the ability to learn and recall spatial information. The Morris water maze is used to estimate this. Colchicine also impairs memory by destroying granule cells in the dentate gyrus of the hippocampus, according to research (Jarrard*et al.,* 1986).Thus, holy basil works by blocking the acetyl cholinesterase enzyme, which breaks down acetylcholine in the brain, to stimulate acetylcholine (ACh) neurotransmission, which is responsible for memory capacity. *Tulsi* thereby enhances memory and cognitive function by increasing the brain's availability of acetylcholine (Pattewar *et al.,* 2011).

Anti-depressant activity: Approximately 121 million individuals worldwide suffer from depression. It addresses mood fluctuations, developing suicidal thoughts, and paying less attention to individualised job (Manu *et al.,2017;* Evelyn *et al.,* 2011). It happens as a result of inadequate levels of the monoamines dopaminergic, norepinephrine, and serotonin in the brain (Laurence *et al.,* 2005; Schildkraut*et al.,* 1965). Consequently, the herbal medication *tulsi* has antidepressant properties. Antidepressant action mechanisms are still being studied; hence they are not completely understood. Because the literature that is currently available claims that many plant parts contain phytochemicals that are involved in the action of anti-depressants, including root extracts, ethanolic extracts of *tulsi* leaves and ursolic acid, eugenol, apigenin, luteolin, apigenin 7-glucuronide, luteolin-7-O-glucuronide, orientin, mollusdistin, and two flavonoids, orientin and vicenin (Matsuoka *et al.,* 1995). The dopamine 2 receptor agonist and ursolic acid, which is primarily known to stimulate the phase of dopamine, nor epinephrine, and serotonin in the brain, have also been linked as shortening the duration of immobility(Schechter *et al*., 2005; Rajan*et al*., 2005; Delini *et al*., 1988).

Anti-anxiety activity: One of the conditions that fall under the category of mental morbidities is anxiety. Although it frequently exhibits terrible, emotional behaviour, it often causes CVS and psychological issues. While certain allopathic antianxiety medications can relieve anxiety disorders, they can have some undesirable side effects. As a result, herbal medications are utilised to treat this illness, reduce side effects, and maybe even stop the chronic effects of allopathic medications. This is made possible by the presence of several secondary metabolites, which improve the drug's therapeutic properties. According to the literature, *O. bascilicum's*ethanolic extract has a therapeutic effect on anxiety disorders (Ross *et al*., 2006). It has been demonstrated in an animal experiment that the administration of Holy basil ethanolic extract significantly increases both the time spent and the number of entrances to the light chamber (Schechter *et al*., 2005; Rajan*et al*., 2005; Delini*et al*., 1988).

Antiepileptic activity: The phrase seizure refers to the brain's neurons firing excessively, which results in (Samleti). Epilepsy, which is the second most common chronic neurological condition in the world after stroke, is the term for the repeated occurrence of seizures (Porter *et al.,* 2011). This illness affects between 40 and 60/1,000,000 persons annually (Deshmukh *et al.,* 2012). Antiepileptic drug use prevented seizures in around 60–70% of the population, whereas the remaining 30–40% of the population had little to no response to the medication (Brodie*et al.,* 2010). However, it is crucial to research the best antiepileptic medications with the fewest adverse effects (Prakash*et al.,* 2005). Given that this condition is caused by three key pathways, including:

- GABA and glutamate neurotransmitters, which are excitatory and inhibitory neurotransmitters, are out of balance.
- voltage-dependent sodium channels opening.
- The NMDA receptor is activated, which then increases the calcium ion influx (Samleti). By enhancing brain neuronal activities, the Holy basil leaf ethanolic extract helps to lessen epileptic symptoms.*Tulsi* extract works primarily by inhibiting voltage-gated Na+ channels, but it also inhibits N-methyl-D-aspartate receptors, which reduces the T-type Ca2+current in the thalamus. Additionally, the medication affects GABAA103's (gamma-aminobutyric acid) agonistic potential. *Tulsi* also prolongs the phenobarbitone-enhanced sleeping period103. According to the available databases, the defensive action of ethanol and chloroform extracts of Holy Basil stem, leaf, and stem calli against tonic hind limb extension (THLE) and the subsequent positive responses against disease demonstrate the drug's potent antiepileptic properties (Jaggi*et al.,* 2003).

Antioxidant activity: The antioxidant activity of each substance was compared to that of ascorbic acid, a common antioxidant. Amol*et al.*

(2018); Joseph *et al.* (2013) and Shankar *et al.* (2012) found that antioxidants simply prevent the formation of oxidative chain reactions, which in turn prevents additional molecules from oxidising. In order to generate energy to power biological activities, oxidation is required by a variety of living things (Anitha*et al.,* 2010). Free radicals have one or more unpaired electrons, which when they interact with another molecule by either stealing or giving away electrons, cause a number of illnesses (Gopi*et al.,* 2012). These chemicals destroy cells irreparably since they are unstable and extremely reactive (Jain *et al.,* 2013). According to earlier research, the presence of free radicals inside the body causes cellular alterations and the emergence of a variety of illnesses. However, the antioxidants included in many herbal medicines might control this (Basavaraj*et al.,* 2012). Around 80% of the world's population relies on medicinal plants to supplement their healthcare requirements (Sharma *et al.,* 2012). The primary building blocks of life are lipids in the membrane, proteins, DNA, and carbohydrates; they may be destroyed by reactive oxygen species. This results in the emergence of several diseases as diabetes, cancer, atherosclerosis, and liver cirrhosis. Antioxidants thereby shield the human body from damage caused by reactive oxygen species (Amrani*et al.,* 2006).In addition to improving the superoxide dismutase property and suppressing the lipid peroxidases, *tulsi* can combat free radicals that damage liver microsomes (Amol*et al.,* 2018;Morankar*et al.,* 2014). The most common antioxidant employed to compare the antioxidant properties was ascorbic acid (Muthukumaran*et al.,* 2015). In several of the investigations, phenols, alkaloids, flavonoids, steroids, and tannins were identified using a qualitative preliminary phytochemical examination (Sarbeen,2015). The antioxidant activities were contrasted with those of ascorbic acid, a common antioxidant. The flavonoids in *tulsi* constituents have membrane-protective properties, which reduces the liver's radiation-induced lipid peroxidation. Eugenol of *tulsi* extract from fresh leaves and stems, which has high antioxidant properties, is one of the active ingredients (Anitha *et al*., 2010). According to the available research, dietary antioxidants offer superior therapeutic potential against a variety of ailments (Amol *et al*., 2018).

CONCLUSION

Since the dawn of civilisation, plants have been utilised all across the world to heal illnesses. *Tulsi* is grown for both religious and therapeutic reasons. It is well-known as a medicinal plant and herbal tea in South Asia. The plant has been given many medical benefits not just in Ayurveda and Siddha but also in Greek, Roman, and Unani traditions. The extensive review of the available literature revealed that *Ocimum sanctum* has a wide range of pharmacological actions. It is highly regarded among herbs with a range of biological potentials, and there is a lot of room for new areas of research. For their analgesic, anti-asthmatic, anti-stress, antihyperlipidemic, and antibacterial effects, crude extracts of numerous plant components have been utilised traditionally. Future research on sacred basil should be emphasized for control of various diseases especially it should be explored as a significant remedy regarding neuropsychological disorders for the welfare and service of mankind. Because of their great value, medicinal plants are utilised in India to treat and cure a variety of diseases. The *tulsi* plant (Ocimum sanctum) is revered. It is mostly employed as medicine and herbal tea. It is employed in the medical systems of Ayurveda, Siddha, Greek, Roman, and Unani. The *Ocimum sanctum* plant is said to have medicinal qualities including antiulcer, anti-stress, antifertility, anti-asthmatic, analgesic, anti-diabetic, anti-inflammatory, anti-oxidant, anti-bacterial, and neuro-protective action, according to several research investigations. The *Tulsi* plant has a significant therapeutic value and is used extensively over the world to cure a variety of ailments, according to several repeated scientific investigations.

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