

**ROLE OF GUDUCHI IN PREVENTION OF OXIDATIVE STRESS – A REVIEW**Suvitha S V<sup>1</sup>, Gayatri<sup>2</sup>, Sarika Yadav<sup>3</sup>, C. R. Yadav<sup>4</sup>

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**ABSTRACT**

Oxidative stress is a phenomenon that occurs in the body when there is an imbalance between the production of oxygen reactive species (free radical) and antioxidant molecules. Rusting of iron takes place on continuous exposure to oxygen. Likewise, the accumulation of free radicals in the body results in oxidative stress which results in tissue damage and thus leads to various diseases. *Rasayana Chikitsa* helps in the attainment of good quality of rasa. *Guduchi* [*Tinospora cordifolia* (Willd) Miers. F. & Thomas] is a marvellous drug having *Rasayana* property belonging to the Menispermaceae family enriched with antioxidant molecules. It has the power to detoxify, rejuvenate and boost the immune system. ‘*Guduchi*’ the word itself conveys the meaning ‘which protects the body from diseases. *Tinospora cordifolia* is well known for its properties such as antioxidant, anti-hyperglycemic, anti-hyperlipidemic, hepato-protective, cardio-protective, neuroprotective, osteo-protective, radio-protective, anti-anxiety, adaptogenic agent, analgesic, anti-inflammatory, antipyretic, thrombolytic agent, anti-diarrheal, anti-

ulcer, anti-microbial and anti-cancer agent. An attempt has been made to review the role of *Guduchi* in the prevention of oxidative stress based on the different studies carried out regarding the antioxidant activity of *Guduchi*. Studies proved that the Phenolic content of *Guduchi* is meant for its antioxidant activity. Based on Ayurvedic theories, *Guduchi* acts at the level of *Agni* and helps in the formation of the fine quality of *rasa*. Also, prevent the accumulation of a toxic substance called *Ama* that which is considered as the root cause of disease.

**Keywords:** *Guduchi*, free radical, Oxidative stress, Antioxidant activity

## INTRODUCTION

Oxygen is a very essential element needed by body cells for its energy requirements. During the use of oxygen for ATP production, cells release some amount of free radicals. Free radicals are the unstable molecule that steals electrons from other molecules by that damages important cell structures. These free radicals will be neutralized by cells own antioxidant enzymes by that it maintains the homeostasis of the body. But contrary to that, when there is excess production of free radicals body cells won't be able to neutralize it. This ultimately leads to oxidative stress. Oxidative stress is defined as excess production of Reactive Oxygen Species (ROS) relative to antioxidant defences. Reactive oxygen species are generated as a metabolic by-product by a biological system such as superoxide radicals, hydrogen peroxide, hydroxyl radicals and singlet oxygen. When free radical production got increases, it starts shows harmful effects on important cellular structures like proteins, lipids and nucleic acid. Oxidative stress is responsible for the onset and progression of various diseases such as diabetes, hypertension, cancer, metabolic disorder and cardiovascular disorder etc. To prevent oxidative stress, it's very essential to make sure of getting enough antioxidants in our diet. Antioxidants are substances that prevent oxidative stress by donating electrons to free radicals. *Rasayana* is a special branch of *Ayurveda* that helps to detoxify the body and also revitalize and nourishes the body. *Rasayana* makes the individual stay healthy due to its magical qualities of medicinal herbs such as immunomodulatory, adaptogenic, antioxidant, nootropic and anti-stress. *Guduchi* is a well-known *Rasayana* drug having synonym as *Rasayani*, Charaka emphasized it under *Medya Rasayana*<sup>1</sup>. *Guduchi* is having properties like

*Tridoshahara, Vayasthapan, Triptighna, Daha-prashaman, Stanyashodhan*, etc. Various research works have been carried out on the antioxidant activity of *Guduchi* and showed significant results too. This review study article helps to evaluate the antioxidant activity of *Guduchi* and its role in cut down various diseases by preventing oxidative stress.

**MATERIALS AND METHOD:** Study materials are collected from various classical ayurvedic texts and modern textbooks, international journals, internet sites and also research articles related to this subject.

## OXIDATIVE STRESS

Oxidation is a very essential process taking place in every cell of our body during energy production. Moreover, oxidative-mediated reactions are involved in many fundamental aspects of life processes such as cell respiration, lipid synthesis, metal metabolism, lysosomes, phagocytosis of foreign bodies, and xenobiotic biotransformation of organic compounds. Free radicals are highly reactive and unstable molecules that are released by mitochondria during energy production. Also, ROS will be produced in the body by exposure to toxins in the environment such as tobacco smoke and ultraviolet light. There are many different varieties of partially reduced reactive oxygen species (ROS) including superoxide ( $O_2^-$ ), hydrogen peroxide ( $H_2O_2$ ), and the hydroxyl radical ( $OH^\cdot$ ). Free radicals have a lifespan of only a fraction of a second, but during that time they can damage DNA, sometimes resulting in mutations that can lead to cancer. Free radicals are oxygen-containing elements with an uneven number of electrons. The uneven number of electrons in free radicals allows them to easily react with other molecules. At the same time, cells produce natural antioxidant enzymes to balance the free radi-

icals. Over accumulation of reactive oxygen species in the body ultimately leads to oxidative stress. Oxidative stress arises when there is an imbalance between free radicals and free radical scavenging molecules. The increased oxidative stress is due to intake of diet rich in fat, sugar, processed food, alcohol consumption, smoking, stress etc. Oxidative stress leads to premature ageing, wrinkles in the skin, poor vision and various lifestyle disorders that account for around 70 % of death worldwide according to a WHO report.

### RASAYANA CHIKITSA

*Rasayana* is a time old concept and mentioned under one among eight branches of *Ayurveda*. The ultimate aim is to maintain the health of a healthy individual and the disease of the diseased person. All bodily tissues are getting nourished from *Ahara Rasa*. *Rasayana* therapy helps in the formation of the best quality of *rasa*. Consequently, *Rasayana* helps in the regeneration, revival and revitalisation of all body tissues. Oxidative stress is considered the root cause of various metabolic disorders. *Rasayana* therapy helps in overcoming oxidative injury. *Guduchi* is a *Rasayana* drug highlighted under *Medhya Rasayana*.

### GUDUCHI

**Botanical name:** *Tinospora cordifolia* (Willd) Miersex Hook. F & Thomas.

**Family:** Menispermaceae (Mene=moon and sperm=seed)

The plant belongs to this family have moon-shaped seeds

### Historical background of origin

Ravana, the king of Lanka overcome with lust, kidnapped Sita the wife of Rama, then the mighty Rama assisted by the army of monkeys fought Ravana and killed him on the battlefield, Lord Indra got greatly pleased at the death of Ravana the enemy of gods, the monkeys who killed by the demons were rendered alive, by sprinkling nectar on them. In all places where drops of nectar fell on the ground running from the bodies of monkeys, there grew the plant of *Guduci*<sup>2</sup>.

### Botanical Description

*Tinospora cordifolia* is a large, glabrous and climbing succulent perennial shrub with rocky bark. Leaves are

petioled, membranous and cordate with broad sinus and 5.0-10.0 cm blade. *Tinospora cordifolia* found throughout tropical India. The flowers are small, yellow and unisexual. Male flowers are fascicled, and females are usually solitary. Drupes, the fruits are ovoid, succulent, lustrous and red when ripe. Seeds are curved.

### Synonyms

*Guduchi, Madhuparni, Amrita, Amritavalli, Chhina, Chhinaruha, Chinnodbhava, Vatsadani, Jivanti, Tantrika, Soma, Somavalli, Kundali, Cakralaksanika, Dhira, Vishalya, Rasayani, Chandrasahsa, Vayastha, Mandala, Devanirmita*.<sup>3</sup>

The word ‘Guduchi’ meaning “that which protect the body from diseases<sup>4</sup>”. Also, it has a synonym as *amrita* because it gives longevity as nectar.

### Rasa Panchaka<sup>5</sup>

*Rasa: Tikta, Kashaya, Katu, Guna: Laghu, Virya: Usna, Vipaka: Madhura*

*Karma: Tridosahar, Rasayana, Sangrahi, Agnivaradhaka, Balya<sup>6</sup>, Stanya Shodhan, Rakta Shodhana, Vishaghna* etc.

### CHEMICAL CONSTITUENTS

Tinosporine, tinosporon, tinosporic acid, tinosporol, tinosporide, tinosporidine, columbin, chasmanthin, palmarin, berberine, giloin, giloinisin, 1, 2-substituted pyrrolidine, a diterpenoid furanolactone, 18-norclerodanediterpene-O-glucoside, aryltetrahydrofuranolignan, octacosanol, nonacosan-1S-one and -sitosterol, cordifolide, unosporin, heptacosanol, cordifol. Cordifolon, magnoflorine, tembetarine, cardiofoliosides A & B. phenolic lignan- 3-(4-dihydroxy-3-methoxybenzyl)-4-(4-hydroxy-3-methoxybenzyl) - tetrahydrofuran, arabinogalactan (various parts) Giloin, Giloinin, Gilosterol, Berberine.<sup>7</sup>

### FREE RADICAL VS AMA

Free radical is the end product of the oxidative reaction in our body. Accumulation of more free radicals end up with toxicity and produce more metabolic disorders such as hypertension, diabetes etc. In *Ayurveda*, free radicals can be correlated with *Ama*. *Ama* accumulation in the body favours the formation of disease in the body. Wherever *Ama* goes and settles, there it produces disease also<sup>8</sup>. When digestive fire

(Agni) gets weak, food enters into stomach won't get digested and forms a toxic substance called *Ama*<sup>9</sup>. According to Ayurveda, *Ama* and *Mandagni*<sup>10</sup> is considered the root cause of all diseases. When *Ama* is found at the level of the digestive tract we can easily clear it out but once it pervaded into deep tissues, it becomes more difficult to eliminate it. *Ama* gets accumulated in channels of the body and disrupts tissue nutrition. It affects physiological processes at the cellular level also.

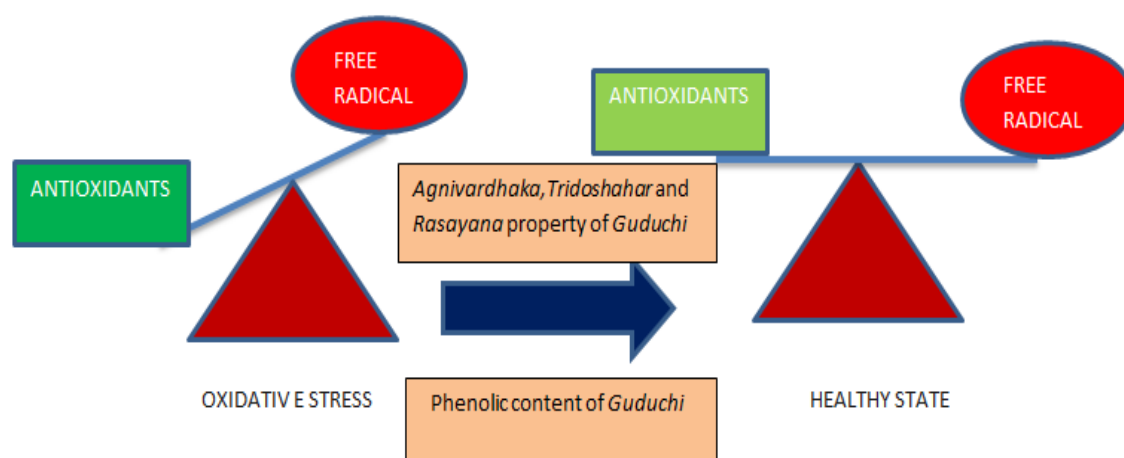
## DISCUSSION

### ROLE OF GUDUCHI IN PREVENTION OF OXIDATIVE STRESS

*Guduchi* is an effective Rasayana drug mentioned under *Medhya Rasayana* as *Churna Kalpana*. Properties of *Guduchi* includes *Tridosahar*, *Balya*, *Jwaraghni*, *Vishagni* and *Agnivardhaka*. Rasayana therapy helps one to get good quality of *Rasa*, *Raktadi Dhatus*. *Ahara Rasa* is known to be the premier nutrition of the body tissues, hence it is counted as a precursor of all tissues. Both qualitative and quantitative normalcy of *rasa* is considered as the normalcy of health. *Ama* accumulation of body is considered as the root cause of all disease whereas in modern science oxidative stress takes place because of accumulation of free radicals resulting in various diseases by damaging important cellular structures. *Guduchi* acts at the level of *Agni*, *rasa* and *Srotas*. *Rasa* of *Guduchi*

is *Tikta*. *Vayu* and *Aakash Mahabhuta* is predominant in *Tikta Rasa*<sup>11</sup>. Due to its *Laghu Guna*, it promotes digestive fire and does *Ama Pachana*, that act as a great preventive measure for various diseases. *Dosha*, *Dhatu* and *Mala* is considered as the root of the body<sup>12</sup>. By *Tridosahar* property, it maintains the equilibrium of *Doshas*. By *Agnivardhaka* and *Balya* property, *Guduchi* helps in the formation of good quality of *rasa*, clears out the toxins accumulated in *Srotas* and do *Dhatu Poshan*.

Various studies have been carried out on the Antioxidant activity of *Tinospora cordifolia*. The chemical constituents reported from this shrub belong to different classes such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides<sup>13</sup>. Antioxidant activity was assessed by DPPH (1, 1-Diphenyl-2-picrylhydrazyl), total reducing power, Total polyphenolic content, Hydrogen peroxide scavenging activity assay, Hydroxyl radical scavenging activity. Studies find out the Phenolic content of *Tinospora cordifolia* is mainly responsible for antioxidant activity<sup>14</sup>. Phenolic compounds can inhibit free radicals by donating hydrogen atoms from hydroxyl group or by chelating metal ions such as iron and copper, also by inhibiting the oxidation of low-density lipoproteins (LDL). By that, administration of drug *Guduchi* helps in preventing oxidative stress shown in Fig 1.



{Fig-1}

## CONCLUSION

Nowadays, due to unhealthy lifestyles and mental stress, the body is more viable to oxidative stress. Oxidative stress damages important cellular structures and makes the body more prone to various metabolic disorders. Metabolic disorders are considered a great burden to socioeconomic development in developing countries. *Rasayana* is the uniqueness of *Ayurveda* mainly stress on better health and prevention of disease. It's better to start with prevention as it cost less in lives and dollars. Oxidative stress can be prevented by maintaining the antioxidant level in the body. *Guduchi* is a marvellous *Rasayana* drug that cut down the progress of pathogenesis due to its *Ag-nivardhaka*, *Amapachana* qualities and is loaded with antioxidant properties. Research proved that the phenolic content of *Guduchi* is responsible for antioxidant activity. So as a part of *Vatatapika Rasayana*, *Guduchi* is strongly recommended in the prevention of oxidative stress.

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