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Green Defender *Epipremnum Aureum* and *Tinospora Cordifolia* for Anti inflammatary activity

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Abstract –

Epipremnum aureum (money plant), a member of the Araceae family, is widely grown as an indoor ornamental plant due to its attractive appearance and ability to adapt to different conditions. Beyond decoration, it contributes to improving indoor air quality by reducing pollutants such as formaldehyde, benzene, and xylene. Scientific studies have explored its structure, chemical composition, and traditional uses, revealing antibacterial and antioxidant properties, along with possible antimalarial, anticancer, and wound-healing effects, although further research is needed to confirm these benefits. In a similar context, *Tinospora cordifolia* has attracted attention for its strong anti-inflammatory potential. Research using Wistar rat models with inflammation-related anemia showed that its extract can lower the expression of the hepcidin gene in liver tissue. Laboratory studies on macrophage cells also demonstrated reduced nitric oxide production and decreased levels of pro-inflammatory cytokines such as TNF -α and IL-1β. The presence of tinosporaside, identified through chromatographic analysis, is believed to contribute significantly to these effects, supporting its potential role in future therapeutic applications.

Keywords –

Epipremunm Aureum, Tinospora Cordifolia, Inflammation, COX inhibitor,Flavonoids, Anti inflammatory.

Introduction –

The ancient, ancestral word inflammation is derived from the Latin inflammare, which means to ignite or burn. The teleological function of inflammation is to preemptively "ignite" in defense against an area of prospective threats and then spontaneously extinguish following threat neutralization, which makes an analogy with fire informative. There are three issues with inflammation: not all hazards, such as blunt trauma, call for an inflammatory reaction. Ischemiareperfusion injury, exposure to toxins or crystal particles, and auto-inflammatory diseases; inflammation is a "equal opportunity offender" that ignites both healthy and diseased tissues; like any fire, there is always a chance of smoldering persistence or unchecked inflammatory spread.In the life sciences, biological items are frequently observed and described while participating in processes that have different, sometimes even diametrically opposed, results; these processes are termed identically and in accordance with the entity in question.In a similar vein, phagocytois refers to both the engulfment and complete digestion of bacteria by a phagocyte as well as the engulfment of bacteria by a phagocyte followed by the bacteria's reproduction and subsequent phagocyte lysis, or the bacteria's consumption of the host cell. The traditional definition of "immunity" at the organism size has been resistance to the effects of infectious agents, which actually means the lack of inflammation when a pathogenic bacterium is present.

Inflammation Response Mechanisms

The coordinated activation of signaling pathways that control the amounts of inflammatory mediators in both local tissue cells and inflammatory cells drawn from the circulation constitutes the inflammatory response. Numerous chronic illnesses, such as diabetes, cancer, arthritis, and intestinal and cardiovascular disorders, are frequently caused by inflammation. All inflammatory reaction processes have a common mechanism that may be summed up as follows, even though they vary depending on the exact type of initial stimulus and where it occurs in the body: 1) Cell surface pattern

receptors identify harmful stimuli; 2) the activation of inflammatory pathways; 3) the production of inflammatory markers; and 4) the recruitment of inflammatory cells.

Activation of Inflammatory Activitation pathways

Common inflammatory mediators and regulatory pathways are involved in inflammatory pathways, which influence the pathophysiology of several chronic diseases. Inflammatory mediators are produced when intracellular signaling pathways are triggered by inflammatory stimuli. TLRs, IL-1 receptor (IL-1R), IL-6 receptor (IL-6R), and TNF receptor (TNFR) interact with primary inflammatory stimuli, which include microbial products and cytokines like interleukin-1β (IL-1β), interleukin-6 (IL-6), and tumor necrosis factor-α (TNF-α). Important intracellular signaling pathways, including as nuclear factor kappa-B (NF-κB), mitogen-activated protein kinase (MAPK), and Janus kinase (JAK)-signal transducer and activator of transcription (STAT) pathways, are triggered by receptor activation.

Inflammatory Protein And Pathways

During trauma, stress, or infection, inflammatory proteins in the blood, such as C-reactive protein (CRP), haptoglobin, serum amyloid A, fibrinogen, and alpha 1-acid glycoprotein, aid in restoring homeostasis and limiting microbial development without the need for antibodies. High-mobility group box 1 (HMGB1), superoxide dismutase (SOD), glutathione peroxidase (GPx), NADPH oxidase (NOX), inducible nitric oxide synthase (iNOS), and cyclooxygenase (COX)-2 are among the enzymes that are abnormally activated. Fro Example The effects of extracellular HMGB1 may be mediated by activation of TLR-coupled signaling pathways. Extracellular HMGB1 primarily targets TLR4, which initiates MyD88-dependent intracellular signaling cascades that activate the MAPK and NF-κB pathways. Inflammatory cytokines including TNF-α and IL-1β are released as a result.

Resoluution of Inflammation

Suppressing the inflammatory response is necessary to stop further tissue damage and the evolution of acute inflammation into chronic, persistent inflammation. Chemokine gradients are gradually neutralized throughout the well-managed process of inflammation resolution, which involves the generation of mediators under temporal and geographical control. White blood cells in circulation gradually lose their ability to detect these gradients and are not drawn to damage sites. Chronic inflammation that is out of control can result from dysregulation of this process. Reduction or cessation of neutrophil tissue infiltration and apoptosis of spent neutrophils, counter-regulation of chemokines and cytokines, macrophage transition from classically to alternatively activated cells, and the start of healing are all examples of inflammation resolution processes that restore tissue homeostasis.

Many people refer to the prosperity plant by its scientific name, Epipremnumaureum (Linden and Andre) Bunting, which is a synonym for Scindapsusaureus. In addition to money plant, this plant is also known by the names Pothos, Silver Vine, Devil's Ivy, and Solomon Island's Ivy. This plant is indigenous to New Guinea and Southeast Asia.Other names for Crassulaovatais include jade plant, friendship tree, lucky plant, and money plant, which is sometimes called the money tree. Another name for Pachiraaquatica is a money tree. As a result, the nomenclature is confusing. However, Scindapsusaureus is cultivated as a money plant in homes throughout Asia. It can be grown as a climber or as a trailer..It is a scrambler shrub that can climb trees and plants that hook over tree branches using aerial roots.Scindapsusaureus leaves resemble those of Philodendron scandens.Epipremnumaureum is a great plant for purifying the air. It is a popular indoor plant because of its attractive marbled leaves and low maintenance requirements. This plant is primarily grown indoors, and its unique quality is that it can thrive in a bottle filled with water or a container devoid of soil. Bright filtered light is ideal for its growth. However, the leaves become discolored under more or less light. There are numerous species and variants within the genus Epipremnum, which is further divided into smaller groups.

Plant Profile –

1. Epipremnum Aurem

Grown for its glossy, green or variegated leaves on cascading stalks, pothos is a low-maintenance herbaceous perennial broadleaf evergreen houseplant belonging to the arum family (Araceae). It is indigenous to the Society Islands. Although the horizontal groundcover only reaches a height of 6 to 8 feet, the climbing and trailing vines can reach a maximum

length of 40 feet. It is ideal for hanging baskets because of its function. It usually keeps the shape of its young leaves because it is a container plant. The Latin name for the species means "golden." Growing pothos is quite simple. It can withstand low light for extended periods of time and likes bright, indirect light. To raise the humidity, use a humidifier or set the plant pot on a tray of moist pebbles. The majority of the leaves will be concentrated at the tips of the stalks as they eventually turn yellow and fall off. To keep stems bushy, prune them back. In water, vines take root with ease. They use brown aerial roots to climb. The plant will start to grow big, mature leaves if it has a support to climb on and enough light.

Fig. *Epipremnum Aurem*

Taxonomical Classification of *Epipremnum Aurem*

- Kingdom : Plantae
- Clade : Tracheophytes (vascular plants)
- Clade : Angiosperms (flowering plants)
- Clade : Monocots
- Order : Alismatales
- Family : Araceae (Arum family)
- Subfamily : Monstereae
- Tribe : Monstereae
- Genus : Epipremnum Schott

Oraganoleptic Properties

- Colour : The powdered firm has a creamy golden to light brown colour
- Odour : Pungent or characteristic, aromatic smell
- Taste : Bitter
- Texture/ Appearance : The leaves are generally glossy, waxy, and heart- shaped, becoming larger and unevenly lobed on mature vines,

Key component of *Epipremnum Aureum* =

Epipremnum aureum was recently referred to as E. pinnatum "Aureum" and treated as a cultivar of *Epipremnum pinnatum*. Following additional research, botanists concluded that the two should be identified as distinct species because to their noticeably different vegetative characteristics. The correct name for plants formerly known as E. pinnatum 'Aureum' is now E. aureum.

Common names include Hunter's Robe, Devil's Ivy, Golden Pothos, and Money Plant.
Look: A trailing vine with heart-shaped leaves that are frequently variegated (marbling) in white or yellow.
Growth Habit: In the wild, it can grow up to 40 feet as a climbing vine by using aerial roots to stick to surfaces, but as a houseplant, it is usually preserved in its juvenile stage and stays small.
Care Requirements: It is extremely resilient, needs low-to-moderate water, and thrives in bright, indirect light.

Toxicity: The plant is well-known for being toxic since all of its parts contain calcium oxalates, which are toxic to both humans and pets if consumed.

Use: Known to enhance interior air quality, this plant is frequently used as a trailing plant in hanging baskets or on shelves.

Traditional Uses

Skin Care: Traditional medicine uses leaf extracts to promote wound healing and lessen skin swelling and itching.
Respiratory Support: Steam inhalation of leaf decoctions is used in several Southeast Asian folkloric practices to relieve bronchitis and clear mucus.
Gastrointestinal Health: It has long been used to treat indigestion and bloating.
Antibacterial/Antifungal: It has long been used in regional medicine to treat bacterial infections or as a crude antiseptic for wounds.
The antibacterial, antifungal, antioxidant, and anti-diabetic qualities of *Epiprenmum Aureum*, also known as Golden Pothos or money plant, are being studied; leaf extracts have shown promise against pathogens such as E. coli. Traditional medicine uses it for gastroprotection and wound healing. The plant effectively removes pollutants like formaldehyde from the air.

Therapeutic and Medicinal Qualities

Antimicrobial and Antifungal: Methanolic extracts of the leaves and roots show strong antifungal activity against Candida albicans and antimicrobial action against Staphylococcus aureus and Escherichia coli.
Anti-diabetic: Research suggests that alcohol and aqueous extracts may have the ability to reduce blood sugar levels in mice.

Wound Healing & Anti-Inflammatory: Studies indicate that E. aureum extracts have antioxidant qualities that may help heal wounds and reduce edema by acting as anti-inflammatory agents.
Gastroprotective: The herb may have anti-ulcer qualities by shielding the stomach lining from oxidative stress.
Respiratory Health: Although there isn't much scientific evidence to support it, some traditional methods employ the plant to relieve respiratory congestion.

Chemical Constituents :

Alkaloids, flavonoids, terpenoids, saponins, phenols, and steroids are among the many bioactive phytoconstituents found in Epipremnumaureum, often known as the "golden pothos" or "money plant." The main chemicals found, especially in leaf extracts, are 8-octadecanone, dibutyl phthalate, vitamin E, and beta-sitosterol. These substances have termiticidal, antibacterial, anti-cancer, and antioxidant properties. Major Active Constituents: Its methanolic leaf extracts include more than 30 phytochemical substances, according to GC-MS research. Among the most notable active chemical components are:In some leaf extracts, dibutyl phthalate (16.75%) is frequently the most prevalent chemical.The two main fatty acid components found in chloroform extracts that contribute to its antibacterial and anti-termite properties are pentadecanoic acid (26.23%) and linolenic acid (22.80%).The plant's nutritional and antioxidant composition is significantly influenced by vitamin E (8.00%) and gamma-sitosterol (8.07%).

Extraction method *of Epipremnum Aureum*

Soxlet Extraction

The verified leaves were cleaned with fresh water and allowed to dry for five days in the shade. A mechanical grinder was used to coarsely ground the dried plant leaves. For later use, the powder was kept in an airtight container. Using a Soxhlet device and 90% ethanol, the hot percolation procedure produced the ethanolic extract. Following extraction, the resultant extract was concentrated using a rotary evaporator and kept in a desiccator.

Maceration Extraction

After being cleaned with tap water, the new leaves, stems, and aerial roots were allowed to air dry. For phytochemical analysis, the air-dried plant pieces were ground into a powder. Powder was kept in an airtight vessel for later use. Methanol, ethanol, and acetone were among the solvents used to extract the powdered plant parts. In a conical flask, two grams of plant powder were dissolved in twenty milliliters of methanol, ethanol, and acetone. The conical flask was covered with aluminum foil and shaken for a whole day to gradually dissolve all of the phytochemicals. The material was shaken and then centrifuged for five minutes at 5000 rpm. The Crude drug Extract are collected into the Supernatant Flask and processed the phytochemical test

Phytochemical Screening test

Test for Alkaloids

1ml of plant Extract + few dros of Mayer`s reagent + few drops of Iodine solution then formation of Cremish yellow coloured precipitate shows the presence of alkaloids.

Test for Glycosides

Killer Killani test: 1ml of plant extract + equal amount of killer killani reagent + few drops of Sulphuric acid then formation of yellow colour solution shows the prensence of glycosides.

Test for Tannins

1ml of plant Extract + 3-4 drops of lead acetate then formation of yellow precipitate shows the presences of tannins.

Test for Saponins

Foams test : 1ml of extract was boiled directly + 2ml distilled water and shake for 20- 30 sec then formation of froath shows the presences of saponins.

Test for Flavonoids

1ml of plant extract + 4-5 drops of 5% flavonoid reagents through the wall of test tube then generation of green colour shows the presence of flavonoids.

Test for Terpenoids

1ml of plant extract + 3-4 drops of chloroform + equal volume of conc. Sulphuric acid added by the wall of test tube then formation of brown colour shoes the presence of terpenoids.

Test for Phenol

1ml of plant extract + 3-4 drops of ferric chloride then formation of bluish green and black colour shows the presence of phenol.

Test for Amino acid

1ml of plant extract + 3-4 drops of ninhydrin reagent then development of purple colour shows the presence of amino acid.

Test for Carbohydrates

1ml of plant extract + 1ml of Barfoedreagent+ heat on water water bath for 1 min then formation of brown coloured precipitate shows the presence of carbohydrates.

2. Tinospora Cordifolia

Hook, *Tinospora cordifolia* (Willd.).f. & Thomson is a deciduous shrub that climbs. It can be found in China, Bangladesh, Myanmar, Sri Lanka, and the tropical regions of India. Plants require a reasonable amount of moisture and can grow in a wide variety of soil types, from acidic to alkaline. Within In essence, Ayurveda uses it for its immunomodulatory, revitalizing, and general adaptogenic properties. In addition to these qualities, the plant possesses numerous other special medical qualities.

Fig. tinospora Cordifolia

Taxonomical classification *Tinospora Cordifolia*

- Kingdom : Plantae
- Subkingdom : Tracheophyta (Vascular plants)
- Division : Magnolipophyta (Flowering plants)
- Class : Magnoliopsida (Dicotyledons)
- Order : Ranuculales
- Family : Menispermaceae (Moonseed Family)
- Genus : Tinospora
- Species : T. Cordifolia (wild.) Hook.f.& Thomson.

Organoleptic Properties:

- Taste : The stem is notably bitter
- Stem characteristics : the stems are thumb- sized or medium –sized, with a waxy, lenticellate bark that peels off easily.
- Color : the bark is light grey or brown, while the inner wood in cream- colored.

Key Characteristics And properties

Morphology: A succulent, glabrous climbing shrub that frequently grows on neem or mango trees.

Stem and Roots: The stem has long, thin aerial roots, noticeable lenticels, and is initially greenish before turning grey-white.Simple, alternating, heart-shaped leaves (cordate).

Flowers/Fruit: Produces meaty red drupes (fruits) and tiny, yellow-green flowers in racemes.Alkaloids (berberine, palmatine), glycosides, diterpenoids (amritosides), and steroids are among the medicinal constituents. **Major Phytoconstituents**: Terpenoids, alkaloids, lignans, and steroids, especially columbin, tinosporaside, and berberine, are abundant in this plant.Parts utilized: Although the entire plant has therapeutic potential, the stem is mostly utilized to make juices, powders (churna), and extracts

.**Safety Note**: Although typically safe, it should be used carefully during pregnancy as it may interact with immunosuppressants and diabetic medicines.

History of *Tinospora Cordifolia* -

Natural goods having therapeutic qualities have been linked to the widespread usage of herbal medicines and health care preparations, such as those found in ancient texts like the Bible and the Vedas, as well as frequently used traditional herbs and medicinal plants. The Chinese were the first to use natural herbal concoctions as medicines, and history shows that plants have been used for therapeutic purposes from 4000–5000 B.C. Secondary metabolites and essential oils with therapeutic value are abundant in medicinal plants. When using medicinal plants for therapeutic purposes, safety is the most important factor, along with its effectiveness, affordability, and accessibility. Because of the aforementioned benefits, these medicinal herbs have been used extensively in the food industry.

Traditional use -

In Sanskrit, T. cordifolia is known as Guduchi and is used to heal a variety of illnesses. Ayurveda, Chinese medicine, and other traditional medical systems have given the plant particular consideration. Because of its therapeutic and restorative properties, it is often referred to as ”Heavenly elixir” or “Amrita.” T. cordifolia has been used to treat asthma, jaundice, diabetes, leprosy, pyrexia, anorexia, gout, skin infections, chronic diarrhea, dysentery, and other conditions in Ayurvedic literature including Charaka, Sushruta Samhita, AstangaSamgraha, and other treatises like Bhava Prakash and DhanvantariNighantu. In Ayurveda, T. cordifolia is classified as a Rasayana medication and is suggested to improve overall body resistance, encourage longevity, and alleviate stress, anxiety, and exhaustion.The entire plant, including the roots, stem, bark, and leaves of T. cordifolia in decoction, is used in traditional use.

Medicinal uses

- Immune System Booster: Often used as an immunomodulator to strengthen defenses against illnesses, particularly recurrent fevers.
- Diabetes Management: Studies show that it is effective in treating Type 2 diabetes by enhancing metabolic characteristics, which helps control blood sugar levels.
- Chronic Fever and Infections: Treats recurring or chronic fevers and infections, including jaundice, by acting as an antipyretic.
- Anti-inflammatory and anti-arthritic: Because of its strong anti-inflammatory qualities, it is used to treat arthritis and other inflammatory joint diseases.
- Digestive and Metabolic Health: Enhances digestion, functions as a stomachic, and aids in the treatment of indigestion and diarrhea.
- Asthma and persistent coughs are treated with respiratory support.
- Skin Disorders: Promotes wound healing and serves as a treatment for a number of skin conditions.
- Hepatoprotective actions that aid in the restoration of normal liver function are provided by liver protection.

Chemical constituents

Due to the presence of multiple chemical elements that belong to several classes, including alkaloids, steroids, triterpenoids, and lignans, its stem, leaves, and roots are mostly known to have pharmacological potential. Stems are utilized because to their greater alkaloid content. Alkaloids, diterpenoids, lactones, glycosides, steroids, sesquiterpenoids, phenolic aliphatic, and polysaccharides are among the many phytoconstituents that are abundant in TC. The plant is a rich source of biochemicals and is used medicinally to treat a variety of diseases brought on by the metabolism of carbohydrates. It is often referred to as a miracle herb in Ayurvedic medicine. The plant is made up of more trace elements (copper and zinc), which have antioxidant properties and shield cells from oxygen radical damage during immunological activation. TC's therapeutic efficacy and abundance of secondary metabolites

Secondary metabolites are abundant in T. cordifolia, particularly in the stem and roots. Important substances consist of:Berberine, Palmatine, Tembetarine, Magnoflorine, Tinosporin, and Choline are alkaloids.Tinosporide, Furanolactone, Columbin, Clerodane derivatives (such as Tinosporaside), and Tinocordifolin are examples of diterpenoid lactones/terpenoids.Glycosides: Syringin; Tinocordiside; Cordifolisides A, B, C, D, and E.Steroids include 20-beta-hydroxy ecdysone, giloinsterol, and beta-sitosterol.Arabinogalactan, a polysaccharide that boosts immunity

Extraction process of Tinospra Cordifolia

Soxhlet extraction

1. The thimble holder is filled with 20 g of powdered Tinosporacordifolia stems.
2. The flask is filled with around 300 mL of ethanol.
3. To prevent sample particles from moving to the distillation flask, the thimble was filled with cotton. The medication was extracted for three hours using ethanol in a Soxhlet unit.
4. The ethanolic extract is obtained by filtering and concentrating it on a Rota evaporator.

Microwave-assisted extraction:

1. The dried Tinosporacordifolia stems were crushed and passed through a 24-mesh sieve for MAE.
2. A 500 mL conical flask was filled with 20 grams of the powdered medication.
3. Eighty percent (v/v) ethanol-water was added to two hundred milliliters.
4. To allow the medication to absorb the solvent, the mixture was thoroughly shook and left for a while.
5. By keeping the flask in the microwave oven and treating it for the microwave procedure, this prevented solvent bumping and improved extraction.
6. The irradiation power was set at 480 W, and the extraction temperature was set at three minutes.
7. The conical flask was removed from the oven once the extraction was finished.
8. Then sufficient quantity of extract are Filtered.

Phytochemical Screening test for Tinospora Cordifolia

Test of Total Alkoids= Plant extract + dil.HCL then filtered and the filterate was tested for alkaloids. The alkaloid test was performed by various test like Mayer`s test, Wagner`s test, Dragendroff`s test, Hager`s test.

Test of Flavonoids= Plant Extract + few drop of sodium hydroxide then formation of deep yellow colour which indicates the presence of flavonoids.

Test of Glycosides= Plant extract + dil. Hydrocloric acid then the different test like modified Brontrager`s test and legel`s test.

Test of phenol = plant Extract + few drops of ferric chloride solution then formation of Bluish colour indicates presence of phenols.

Test of Saponin =

Forth test =Plant extract + distilled water to 20 ml and were shaken for 10 -15 min . then formatiion of foam of height of 1 cm represents the presence of saponins.

Result-

The study shows that Epipremnum aureum and Tinospora cordifolia are rich in bioactive compounds such as alkaloids, flavonoids, terpenoids, and glycosides. *E. aureum* exhibits antimicrobial, antioxidant, wound-healing, and air-purifying activities, while *T. cordifolia* demonstrates strong anti-inflammatory and immunomodulatory effects, including reduction in pro-inflammatory cytokines and hepcidin expression in experimental models.

Conclusion –

Both plants show significant therapeutic potential for managing inflammation, infections, and chronic diseases. However, further detailed clinical studies and standardization are required to confirm their safety, efficacy, and mechanisms before their widespread medicinal application.

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