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REVIEW ON NEELAKURINJI: A BEAUTIFUL FLOWER

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Abstract: Strobilanthes Kunthiana (also known as NeelaKurinji) grows on the Western Ghats' hill slopes at elevations ranging from 6000 to 7000 feet. It's a vivid blue bloom in the shape of a bell. The flower is special since it only blooms once every twelve years. S. Kunthiana flowers are members of the Acanthaceae family. Gaining additional knowledge about the pharmacognostic nature, pharmacological activity, and different identification tests associated with the plant Neela Kurinji is the primary goal of this review.

Index Terms - ***Strobilanthes kunthiana*, Acanthaceae, Pharmacognostic, Pharmacological.**

I. INTRODUCTION

By manipulating the medicinal qualities of various plants, herbal medications support bodily healing and balance. India is a very good source of therapeutic herbs. Different kinds of herbal plants are utilized to make various herbal medications. Approximately 8000 species of plants are known to have medicinal properties. For centuries, traditional medical systems like Ayurveda and Traditional Chinese Medicine have employed herbal medicines. The medicinal applications of various herbal medications vary. Several varieties of herbal plants are used in India to make herbal medications. Herbal medications are a type of healthcare that derives their therapeutic benefits from plants and plant extracts. Some of the compounds found in herbal plants include flavonoids, phenolic compounds, alkaloids, and terpenoids. A wide range of illnesses, including those relating to the heart, digestive tract, skin, and respiratory systems, can be treated with herbal medications. [1,3]

Known by many names, including NeelaKurinji, Strobilanthes Kunthiana is a shrub primarily found in India's Western Ghats. One blooming cycle, occurring every 12 years, is characteristic of Strobilanthes Kunthiana. Plants of the genus Strobilanthes, which are in the family Acanthaceae, include Strobilanthes Kunthiana. Originating from the Greek words "strobilus," which means cone, and "anthos," which means flower, is Strobilanthes Kunthiana. Purplish flowers are what give the Nilgiri Hills their other name, "Blue Mountain."[2,5]

Strobilanthes Kunthiana possesses a wide range of therapeutic benefits, including anti-inflammatory, anti-osteoarthritic, analgesic, antioxidant, hepatoprotective, anti-fungal, anti-giardial, anti-microbial, and UV protection qualities. [4]

Plants that flower only once in their lifetime, known as monocarpic or semelparous species like Strobilanthes Kunthiana, eventually die. Strobilanthes Kunthiana is pollinated by butterflies and honey bees. It is discovered that the nectar that honey bees gather from these flowers is highly flavorful, nutrient-rich, and medicinal. The soft texture of the plant's elliptical leaves is attributed to their fine hair covering. [2,4]

The striking diversity of Strobilanthes species in Asia—more than 200 species totals, with more than 150 of those species found in India, mostly in the Nilgiris and Western Ghats. Neelakurinji, or Strobilanthes Kunthiana, is a plant that grows up to 180 cm tall in ideal conditions and can withstand elevations of 1300 to 2400 meters. Finding out about the genus's chemo-taxonomical relationship and the diverse biological activities—such as antioxidant qualities—connected to Strobilanthes plants is fascinating. Strobilanthes species grow wild in the Nilgiri ranges at elevations ranging from 6000 to 7000 feet. [5]

For this study secondary data has been collected. From the website of KSE the monthly stock prices for the sample firms are obtained from Jan 2010 to Dec 2014. And from the website of SBP the data for the macroeconomic variables are collected for the period of five years. The time series monthly data is collected on stock prices for sample firmsand relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

II. PLANT PROFILE

Fig 1.1 *Strobilanthes Kunthiana* [2]

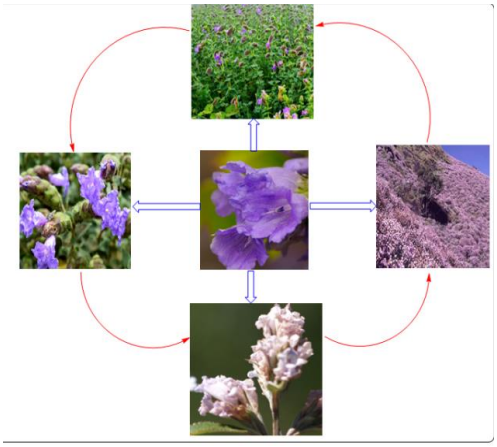

Fig 1.2 Flower growing shrub of *Strobilanthes Kunthiana* [5]

Botanical Name	-	*Strobilanthes Kunthiana* Need T Andres
Synonyms	-	Phlebophyllum Kunthiana, Strobilanthes Nilgirianthsis, Ruellia kunthianus
Family	-	Acanthaceae
Vernacular names	-	Neelakurinji, Kurinji
Kingdom	-	Plantae
Order	-	Lamiales
Sub-kingdom	-	Phanerogamia
Division	-	Angiospermia
Class	-	Eudicots
Sub-class	-	Asterids
Genus	-	Strobilanthes

2.1 Distribution – Strobilanthes Kunthiana is found mostly in India's Western Ghats, as well as the states of Kerala, Karnataka, and Tamil Nadu, which are recognized for their biodiversity. The flower blooms in the Western Ghats in chilly, foggy high-altitude locations. [2]

2.2 Description - It is a bushy shrub that grows in clumps or groups and can reach a height of 1-2 meters. The stems are quadrangular and erect, with noticeable nodes. The leaves are elliptic-ovate in shape, measuring about 5 x 2.5 cm, with a crenate-serrate edge and a coriaceous texture. The leaves have a scabrid upper surface and a white-villous lower surface between the veins. The spikes are about 8 cm long, occasionally branching, and supported by leafy bracts. The bracts are elliptic-ovate in shape, about 1.2 cm long, sharp at the tip, and white-villous. The calyx is about 1.2 cm long, floccose-villous, with linear-lanceolate segments that connate midway from the base. The corolla features a hairy tubular ventricose part that gradually develops from the base. There are five orbicular lobes. The stamens are two and monodelphous. The filaments are around 7 mm long and pilose. The ovary is glabrous but hairy at the apex, and the style is about 1.5 cm long and hairy. [1, 2]
The root, stem, leaves, and flowers of Strobilanthes Kunthiana are employed.

2.3 Chemical constituents - Compounds found in Strobilanthes Kunthiana include alkaloids, tannins, flavonoids, steroids, saponins, glycosides, phenol, and terpenoids. [6]

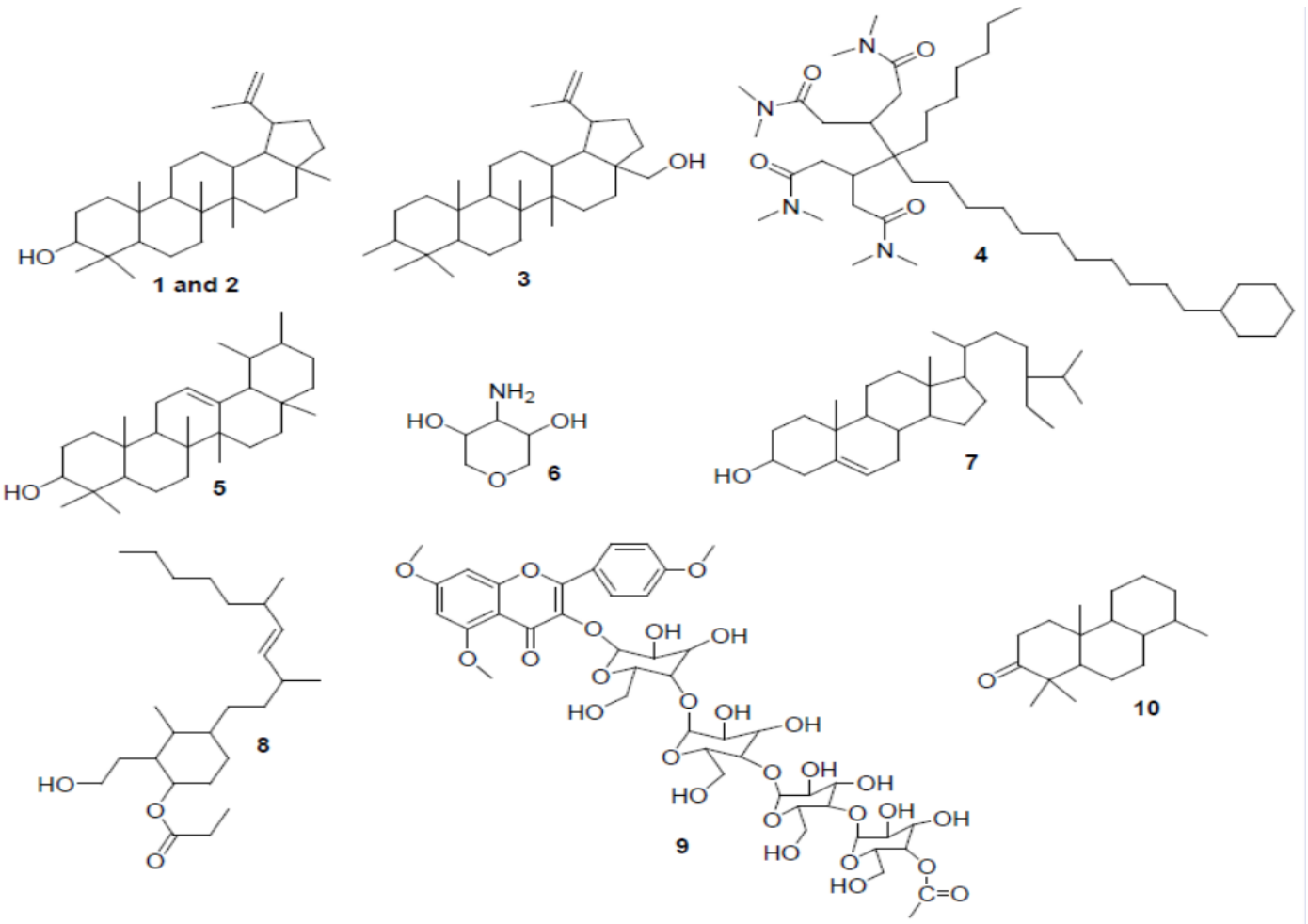

Fig 1.3 Chemical structure of isolated compounds from *S. kunthianus* [5]

Lupeol (1and 2), Botulin (3), 3,5-bis-(dimethylcarbamoyl)methyl)-4-(11-cyclohexylundecyl)-4-heptyl-N1,N1,N7,N7-tetramethylheptanediamide (4), α-amylin (5), 4-amino-tetrahydro-2H-pyran-3,5-diol (6), Sitosterol (7), 2-(2-hydroxyethyl)-3-methyl-4-((E)-3,6-dimethylundec-4-enyl)cyclohexyl propionate (8), Flavone glycoside (9), Decahydro-1,1,4a,8-tetramethylphenanthren-2(1H,3H,4bH)-one (10). [5]

2.4 Biological Properties - Anti-inflammatory and anti-osteoarthritic properties, analgesic, antioxidant, antibiofilm agent, enzyme inhibitor, central nervous system depressant, and even UV radiation protection. It also has antifungal, antibacterial, antiseptic, antimicrobial, and cytotoxic effects. [2]

2.5 Other Strobilanthes species - *Strobilanthes crispus, S. callosus, S. ixocephala, S. auriculatus, S. discolor, S. cusia, S. cuspidatus, S. foliosus, S.consanguineus, S. gossypinus, S. pulneyensis, S. perrottetianus, S. papillous, S. neilgherrensis, S. wightianus, S. urceolaris, S. sessilis, S. asper, S. zenkerianus, S. mincranthus, S. luridus, S. homotropus, S. violaceus and S. amabilis.* [2]

2.6 Chemical constituents Isolated from other Strobilanthes species - Strobilanthes callosus and Strobilanthes ixiocephala have lupeol as a chemical component. Strobilanthes cusia's chemical compounds include Trypanthrin, Indigo, and Indirubin. Strobilanthes crispus has several chemical elements, including p-hydroxy benzoic acid, ferulic acid, vanilic acid, gentinic acid, p-voumeric acid, sitosterol, Stigmasterol, and Caffeic Acid. [2]

2.7 Biological activities of Other Strobilanthes species - Strobilanthes cusia, also known as banlangen, has been shown to have antipyretic, antiviral, anti-inflammatory, and anti-influenza properties. Strobilanthes crispus has traditionally been utilized for its anti-diabetic, antilytic, laxative, anti-AIDS, antileukemic, and hepatitis effects. [6]

III. MACROSCOPICAL FEATURES

The plant is densely branching. The leaves have a thick and leathery texture, are dark green and scaly on the upper surface, and reticulate with white villous on the lower surface. The leaf border is crenate-serrate, and the petiole is 1 cm long. In the form of a branching or unbranched spike, the inflorescence is either terminal or axillary. The calyx is composed of five joined sepals with linear and lanceolate lobes. The petals are held together by two stamens (Bilobed), which have dithecous anthers and parallel lobes.

The hair on the seeds is thick. The corolla is pale-blue to pastel purple in hue, with 5 joined petals that form two lobes. The ovary is superior, with two ovules in each carpel and two joined carpels. The juvenile stem is angular with four ridges, and the leaves are 5 cm long and 3 cm wide, elliptic-lanceolate to obovate. The bracts and bracteoles are lush and conspicuous. [4,5,6]

IV. MICROSCOPICAL FEATURES

4.1 Leaf

A robust midrib and lateral veins go across the leaf. The Mid rib measures 750 µm in the vertical plane and 800 µm in the horizontal plane. On the adaxial side, the midrib bears collenchymatous cells and a shallow median depression. The leaf's abaxial surface has an irregular contour with thin, continuous epidermal cells. The ground tissue is parenchymatous, with cells that are broad, angular, and thin-walled. The vascular strand is tiny and solitary, with around eight parallel strands. Uniseriate is made up of narrow xylem and wide phloem components. The lateral veins emerge from the bottom side of the lamina and extend for 650 µm vertically and 500 µm horizontally. The epidermal layer is thin, and the parenchymatous tissue is compact. The vascular strand is tiny, arc-shaped, and has four to five short rows of xylem components and a deep bowl-shaped line of phloem elements. [2,6]

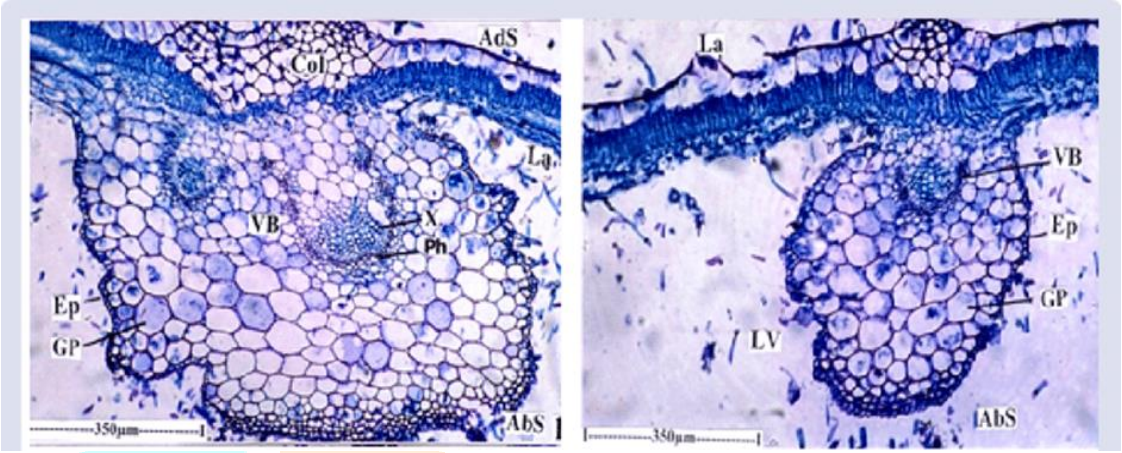

Fig 1.4: Microscopic features of leaves of *S. kunthianus* [2]

4.2 Lamina

Strobilanthes Kunthiana lamina has a smooth and hairless upper surface and abundant hairs on the lower side. The upper epidermis is broad, with vertically oblong cells and a thick cuticle that is approximately 40 m thick. The epidermis on the lower side is slender and made up of cylindrical cells. It has dense covering-type trichomes, including glandular trichomes that are 30-40 µm tall and 20-30 µm wide. Both sides of the lamina have these trichomes. The middle layer, known as the mesophyll, contains compact and narrow palisade cells that are around 50 µm tall. A small spongy parenchyma zone composed of three or four spherical or lobed cells exists beneath the palisade layer. [2,5,7]

4.3 Petiole

When viewed from the adaxial side, the petiole has the appearance of a wide pot. The upper side is flat with short, broad wings. The epidermal cell layer is thin and composed of tiny, cube-shaped cells. Collenchyma is divided into two or three layers on the upper side and six or seven layers on the lower side. Ground tissue is made up of thin-walled, compact, circular to angular cells. There is a single, wide, bowl-shaped vascular strand inside the petiole. This strand is made up of a series of thin, parallel files of angular, thick-walled xylem components. The petiole measures 1.2 mm in height and 2.3 mm in width, and the vascular strand is 150 µm thick. [5,7]

4.4 Stem

This plant's young stem is around 3 mm thick and has a four-angle form. The epidermal layer is thin, and the cells are square in shape with numerous trichomes. The vascular cylinders are narrow and hollow, with four angles. It is made up of short tapering circular bundles of xylem fibers and xylem components.

The phloem is made up of sieve elements and parenchyma cells that cover the outside of the xylem cylinder. The cortex is separated into an outer zone of parenchymatous cells, which is around 250 µm broad. There is also a small layer of chlorenchymatous cells in the cortex. [2,6]

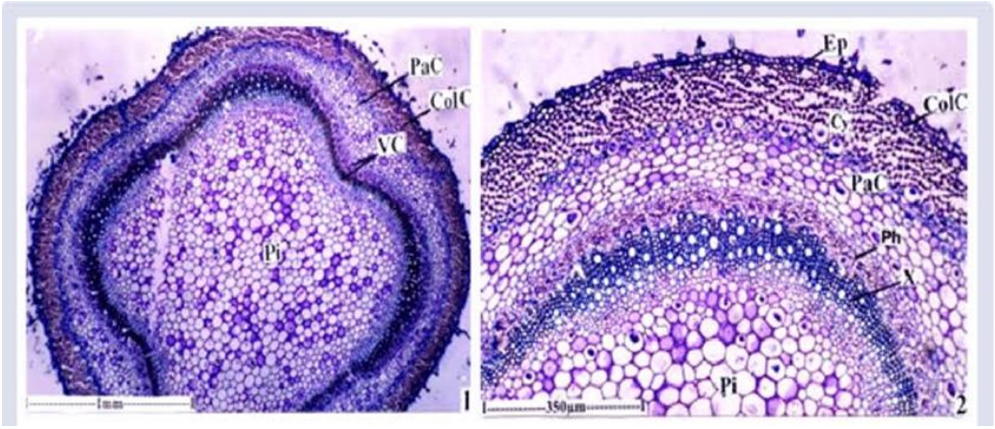

Fig 1.5 Microscopic features of stem of *S. kunthianus* [3]

4.5 Root

The contour of the Root's outer surface is uneven and irregular. The cells in the cortex of the roots are tiny, elliptical, and dense in the inner section of the cortex. Secondary phloem is short but continuous, whereas periderm is not continuous and can only be observed in a few places. The cortex has an outside zone of parenchyma cells that are not packed together and are round, wide, and vast. [2,7]

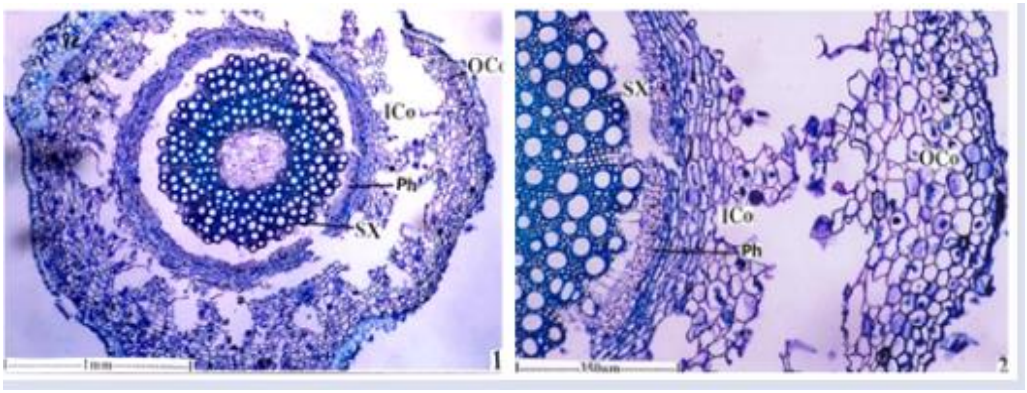

Fig 1.6 Microscopic feature of Root of *S. Kunthianus* [2]

4.6 Secondary Xylem

The secondary xylem is densely packed with these large, circular vessels that are dispersed among thick-walled fibers. The diameter of the vessels steadily grows as you travel towards the outside part, reaching around 40 µm wide. The pith, on the other hand, is narrow and composed of thin-walled, round, and tightly packed parenchyma cells. [1,6]

4.7 Fruit

The blossoms become fruits and seeds, and the plants die. During the next monsoon, the seeds germinate into approximately 700 seedlings per square meter. Some withstand insects, birds, and animals, growing quietly for 12 years before the next flower extravaganza. [4,5]

V. PHARMACOLOGY ACTION OF STROBILANTHES KUNTHIANA

5.1Anticancer Activities

Breast cancer is a leading cause of death in women, and current treatments include drawbacks such as drug resistance and toxicity. Other treatments, such as hormone therapy, surgery, radiation, and immunological therapy, have disadvantages such as bioavailability issues and non-selectivity. To overcome these issues, scientists are looking into novel chemicals that are less hazardous and more successful at treating cancer. The Strobilanthes Kunthiana plant is one possible option, as it has showed promise in cancer treatment with fewer side effects. Docking studies are being conducted in an attempt to assess its receptor binding. It's critical to realize that the aromatase enzyme's ability to convert testosterone to estrogen can have an impact on breast cancer. [8,9]

5.2 Analgesic Activities

The building blocks of membrane phospholipids are fatty acids. They are essential for producing lipid mediators and preserving the equilibrium of phospholipids in membranes. Phospholipase A2 inhibitors are drugs that can be used to treat disorders that are associated with increased platelet generation and aggregation, such as peripheral vascular disease. By preventing the PLA2 enzyme from breaking down membrane phospholipids into platelet-activating factor, these inhibitors function. [32] Phytochemicals found in Strobilanthes kunthiana have the ability to inhibit the PLA2 enzyme. Numerous physiological processes, including as phospholipid digestion, metabolism, host defense, and signal transduction, are aided by phospholipase A2. Furthermore, eicosanoids—which are essential for inducing immunological responses, inflaming the body, and reducing inflammation—are produced from arachidonic acid by enzymes like COX and LOX. [5,6,8]

5.3 Anti-Inflammatory Activities

A plethysmometer was used to determine the rat's initial hindpaw volume in the carrageenan-induced paw edema experiment. Two sets of rats were created: one for testing and one for control. While the test group was administered methanolic extracts derived from flowers, stems, roots, and leaves, the control group was given merely the vehicle. Subcutaneous injection of carrageenan in saline (1% 0.1ml/rat) was performed in the right hind paw. [31]Throughout the course of three hours, the paw volume was measured every hour. Over time, it was discovered that the percentage inhibition increased as the percentage rise in paw volume between the test and control groups increased. When administered at dosages of 100 and 200 mg/kg, respectively, over a 1-3 hour period, the % inhibition of the methanolic flower extract ranged from 21.70±1.17 to 40.50±0.36 and 30.82±0.63 to 50.76¬0.66. In this investigation, the standard was ibuprofen. [1,6,8]

5.4 Antioxidant Activities

Of all the extracts, the crude methanol floral extract had the greatest total phenol concentration. Strong antioxidant activity was shown by the ethyl acetate extracts of the root and stem in vitro; in the ABTS method, they outperformed ascorbic acid. In comparison to other extracts of the root and stem, these extracts exhibited superior activity. In the ABTS, H2O2, and total antioxidant capacity tests, the crude methanol flower extract likewise demonstrated strong antioxidant activity. Among the methanol extracts, it had the highest potency. But when it came to Hep-2 and HeLa cell lines, none of the extracts had much cytotoxic effect.[5,6]

5.5 Antifungal Activities

In three different types of fungi—Aspergillus niger, Penicillium species, and Saccharomyces cerevisiae—the antifungal qualities of the leaf and stem extracts of Strobilanthes integrifolius, Strobilanthes sessilis var. ritchiei, Strobilanthes ciliatus, and Strobilanthes ixiocephalus were studied. By employing the agar well diffusion method, it was discovered that the ethanolic and methanolic extracts of all four species exhibited greater antifungal activity in comparison to the water extract. Furthermore, total inhibition of fungal growth was shown by the chloroform extract. [4,6,8]

5.6 Antidiabetic Activities

Alloxan-induced diabetes in rats: extraction of antidiabetic activity. Next, in vitro tests were performed to see if the separated chemicals could block the diabetes-related α-amylase enzyme. [9 ,10]

5.7Antiulcer Activities

Strobilanthes Kunthiana leaf extract clearly has a potent antiulcer effect based on animal studies. It has significantly more protective and stomach-anti-secretory qualities when compared to the reference medication, omeprazole. The extract is safe even at relatively high concentrations. The anti-ulcer activity is probably caused by the presence of flavonoids. [11]

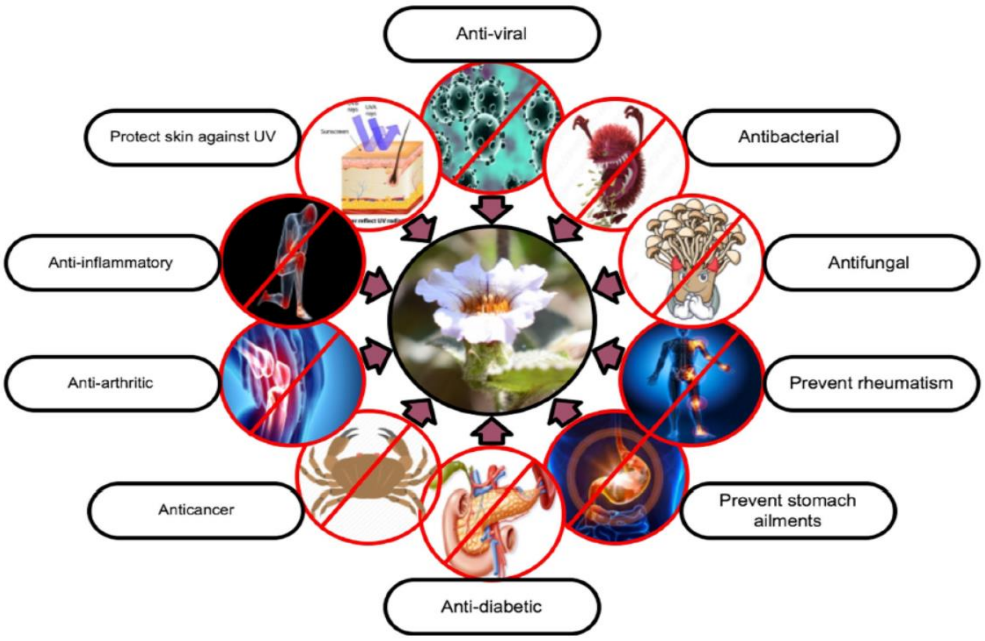

Fig 1.7 Diagrammatic presentation of pharmacological properties of S. kunthianus [1]

VI. EXTRACTION

6.1 Pre-Extraction

The whole plant was cleaned with water and separated into sections such as stems, leaves, flowers, and roots prior to the extraction procedure. After being sun-dried, each component was separately ground into a powder using a mechanical blender. [7,8]

6.2 Successive Extraction

Using 2.5 liters of petroleum ether, chloroform, ethyl acetate, and methanol in a Soxhlet apparatus separately for 18–20 hours, the 500 g of powdered Strobilanthes Kunthiana root and stem were extracted. After that, the extracts were concentrated at 35–40 degrees Celsius in a rotary evaporator with lowered pressure. When they were finally ready to be used, they were kept in a refrigerator at 4 degrees Celsius. [7]

6.3 Cold Maceration

The 250 grams of powdered leaves and flowers were steeped in 1.5 liters of methanol and stirred for seven days in preparation for the cold maceration process. Following that, the mixture was filtered, and any liquid that remained was extracted by squeezing the residual mass. After being compressed, the bulk was further filtered and macerated for a further seven days. Finally, using the previously described procedure, the mixed filtrate was concentrated. [7,8,10]

6.4 Crude Extraction

A Soxhlet apparatus was used to extract the 500 g of powdered S. kunthianus root, stem, leaves, and flowers over the course of 18 to 20 hours. 2.5 liters of methanol were used for each extraction. The identical procedure that was previously described was used to concentrate the extracted materials. [6,7]

VII. IDENTIFICATION TEST

7.1 Test For Alkaloids

Add a few drops of diluted HCl to modest volumes of the methanolic extract. Wagner's reagent should be applied to the filtrate after filtering. There will be a reddish-brown precipitate if alkaloids are present. [33]
To 2 milliliters of peel extract, add 2 milliliters of strong hydrochloric acid. Mayer's reagent was then added in a few drops. The presence of alkaloids is indicated if a green or white precipitate forms. [12,15,16]

7.2 Test For Carbohydrates

Add two drops of an alcoholic alpha-naphthol solution to two milliliters (mL) of the filtrate. 1 mL of concentrated sulfuric acid was added along the test tube's sides after the mixture had been well shaken. The mixture was then allowed to stand. The presence of carbs is indicated by the appearance of a violet ring. [12,15,16]

7.3 Test For Glycosides

50 milligrams of the extract were hydrolyzed for two hours in a water bath using strong hydrochloric acid. Once the hydrolysate was filtered, add 2 mL to 3 mL of chloroform, and shake. The chloroform layer was then separated, and 10% ammonia solution was added to it. When the color turns pink, it indicates the presence of glycosides. [10,15,16]

7.4 Test For Saponins

5 mL of distilled water should be combined with 2 mL of the filtrate. Shake the suspension for fifteen minutes in a graduated cylinder. When a 2 centimeter layer of form forms, saponins are present. [15,16,17]
Add 2 milliliters of distilled water to 2 milliliters of peel extract. After that, shake the mixture lengthwise for 15 minutes in a graduated cylinder. If there is a 1 cm layer of foam, saponins are present. [12,15,16]

7.5 Test For Protien

Add a few drops of Bradford reagent to one milliliter of the sample. The presence of proteins is shown by the blue hue that is acquired. [12,15,17]

7.6 Test For Phytosterols

50 mg of the extract should be dissolved in 2 mL of acetic anhydride. Next, gradually apply one or two drops of sulfuric acid that has been concentrated around the test tube's sides. Numerous color changes are indicators of the presence of phytosterols. [12,15,16]

7.7 Test For Terpenoids

Thoroughly shake 1 milliliter of the extract with 2 milliliters of chloroform. Next, fill the test tube with an equivalent volume of concentrated sulfuric acid. A color shift from yellow to brick red indicates the presence of terpenoids. [12,15,18]

7.8 Test For Fixed Oils

Gently squeeze a tiny portion of the extract between two filter sheets. If there are oil stains on the paper, there are fixed oils present; if there are no oil stains, there are no fixed oils present. [15,16,18]

7.9 Test For Phenolic Compounds

2 mL of the extract should contain a few drops of a neutral 5% ferric chloride solution. The presence of phenolic compounds is indicated by the presence of a dark green tint. [12,15,16]

7.10 Test For Flavonoids

To the extract, add a little 10% ammonium hydroxide solution. Yellow fluorescence indicates the presence of flavonoids. [12,16]

7.11 Test For Tannins

To 1 mL of peel extract, add 2 mL of 5% ferric chloride. The presence of tannins is indicated if a dark blue or greenish black tint is achieved. [12,19,20]

7.12 Test For Steroids

A few drops of strong sulfuric acid was added to 1 ml of peel extract and an equivalent amount of chloroform. Brown ring formation was seen, indicating the presence of steroids. [21,23]

7.13 Test For Quinones

Combine one milliliter of strong sulfuric acid with milliliter of peel extract. If the color red is visible, S. Kunthiana is present. [24]

VIII. Conclusion

Numerous medicinal active ingredients with distinct chemical components have been found in the review study conducted on S. kunthiana. It contains alkaloids, glycosides, flavonoids, phenolic chemicals, and tannins, which phytochemical study indicates can be used further in the development of traditional remedies. To confirm the identification and standardize the plant, pharmacognostic analysis of the several plant sections of S. kunthianus was conducted. The study focused on the different microscopical characteristics of leaves, flowers, stems, and roots. Comprehending and defining the therapeutic attributes of herbal plants can facilitate the creation of novel chemicals and improved methods for isolation.

REFERENCES

[1] Bera, S. 2020. Botany, pharmacology and conservation status of wonder flower: Neelakurinji (Strobilanthes kunthiana (Nees) T. Anderson ex Benth). BNRC, 44 (3): 24-26.

[2] Balasubramaniam, G. 2020. Pharmacognostical, Physicochemical and Phytochemical Evaluation of Strobilanthes kunthianus (Acanthaceae). Pharmacogn, J. 12 (2):731–741.

[3] Shabna, A. 2021. Strobilanthes Kunthianus: An Overview. Int. j. res. Sci, 08 (4): 54–57.

[**4]** Sharma, M. 2008. Reproductive strategies of Strobilanthes kunthianus, an endemic, semelparous species in southern Western Ghats, India. Bot. J. Linn. Soc, 09 (5): 155–163.

[5] Balasubramaniam, G. 2020. Isolation and Structural Characterization of Phytoconstituents from Strobilanthes kunthianus ArticleView. Pharmacogn J, 12 (1): 1605–11.

[6] Arya. C. 2022. A Mechanistic Study of Analgesic and Anticancer Activity of unexplored plant Strobilanthes Kunthiana Phytocosntituents using Molecular Docking Studies, 3 (6): 1-27.

[7] Prabakaran, R. 2018. GCMS, phytochemicals and antioxidant activities of in vitro callus extracts of Strobilanthes kunthiana (Nees) T. Anderson ex Benth: An endemic plant of Acanthaceae. Braz. J. Biol. Sci, 5 (3): 359–72.

[8] Shetkar, S. 2016. Antifungal Activities of your Strobilanthes Species from Northern western ghats of India. Research, 3 (6): 1–4.

[9] Anti-diabetic activity of ethanolic extract of Holostemma ada Kodien Schults in alloxan induced diabetic rats. Int. J. Endocrinol. 2009; 5 (4): 37-41.

[10] Joseph, S. 2016. Evaluation of Antidiabetic activity of Strobilanthes Cuspidata in alloxan induced diabetic rats and the effect of bioactive enzyme. J. pharmacogn. Phytochem, 5 (2): 1–7.

[11] Dubey, A. 2022. Study of Antiulcer potential of hydroloconolic leaves extracr of strobilanthes kunthiana. AJPER, 11 (3): 1-9.

[12] Edeoga, O. 2005. Phytochemical constituents of some Nigerian medicinal plants. AJB, 4 (1) : 685–8.

[13] Kusumoto,T. 1992. Inhibitory effects of indonesian plant extracts on reverse transcriptase of an RNA Tumour Virus (I). Phytotherapy Research, 6 (3) : 241–4.

[14] Yogespiriya, S. 2005. OF. Histological Study During Hepatocarciniogenesis in Rats Treated With Strobilanthes crispus Extract. J. Biol. Sci, 5 (2) : 153–7.

[15] Sellappan, K. 2016. Phytochemical analysis of Strobilanthus Blume species from Northern western ghats of India . Int. J. Curr. Pharm. Res, 8 (5) : 1-4.

[16] Janakrishnan,V. 2023 Phytochemical and Invitro Antioxidant analysis of Strobilanthes Kunthiana Flower. ISSN, 22 (7) :1–9.

[17] Agarwal, B. 2003. Anti-inflammatory and antiarthritic activities of lupeol and 19α-H lupeol isolated from Strobilanthus callosus and Strobilanthus ixocephala roots. Indian J Pharmacol, 35 (6): 384-7.

[18] Ebada, S. 2020. In vivo antiulcer activity, phytochemical exploration, and molecular modelling of the polyphenolic-rich fraction of Crepis sancta extract. Inflammo pharmacology, 28(1) : 321-31.

[19] Balasubramaniam, G. 2020. Analgesic and Anti-inflammatory Activities of Strobilanthes kunthianus in Experimental Animal Models. Research J. pharm. and tech, 13(12) : 5844-5850.

[20] Singh, B. 2002. Anti-inflammatory and anti-microbial activities of triterpenoids from Strobilanthes callosus nees. Phytomedicine, 9 (4): 355-9.

[21] Cheol Shin, H. 2006. An antioxidative and anti-inflammatory agent for potential treatment of osteoarthritis from Ecklonia cava. Arch Pharm Res, 29 (2): 165-71.

[22] Singh, B. 2014. Antioxidant Property for lipophilic extract of Strobilanthes kunthiana flowers. Indian J Res Pharm Biotech. 2(1) :1005-9.

[23] Nair, B. 1988. Anti-inflammatory effect of Strobilanthes heyneanus leaves a biochemical study. J Res Ayurveda and siddha, 9(3): 49-58.

[24] Jaksa, S. 2004. Cancer induction and effect of Strobilanthes crispus leaf extract on liver histology and enzymes changes in rats. J Trop Plants. 5(4):187-92.

[25] Desu, R. 2011. In-vitro anti-inflammatory and anti-osteoarthritic activities of Strobilanthes kunthianus and Strobilanthes cuspidatus. Int J Res Pharm Chem, 1(4):1265-8.

[26] Rahmat, A. 2006. Chemical constituents, antioxidant activity and cytotoxic effects of essential oil from Strobilanthes inspus and Lawsonia inermis. J Biol Sci, 6(1): 1005-10.

[27] Saha, N. 2008. In vitro free radical scavenging activity of Ixora coccinea L. Bangladesh Journal Pharmacology, 4(7): 90-96.

[28] Ismail, M. 2000. Chemical composition and antioxidant activity of Strobilanthes crispus leaf extract. J Nut Biochem, 11: 536-42.

[29] Everlyne, M.2015. Spectral analyses of the bioactive compounds present in the ethanolic leaf extract of Strobilanthes kunthiana (Nees) T. Anderson ex Benth. Adv Biores, 6 (3): 65-71.

[30] Rajesh, G. 2004. Protective effect of Glycyrrhiza glabra Linn. on carbon tetrachloride-induced peroxidative damage. Indian J Pharmacol, 36 (7): 284-6.

[31] Singh, D. 2012. In-vitro antigiardial activity of ethanolic extract and fractions from Phlebophyllum kunthianum, Journal of Natural Remedies, 4(1): 68-71.

[32] Arul, V. 2005. Studies on the anti-inflammatory, antipyretic and analgesic properties of the leaves of Aegle marmelos. J Ethnopharmacol, 4(7) :159-63.

[33] Shekar, S. 2009. Anti-inflammatory activity of ethanolic and acetone extracts of Bauhnia variegate. Research J Pharma Dosage Forms and Tech, 1(2): 97-9.