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A Review on Pencil Cactus (*Euphorbia tirucalli)*

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***Abstract:** In this review, we looked at medicinal plants that are used to treat various illnesses. These are a few of the naturally occurring herbal plants that have a wide range of chemical components that are used to cure different diseases. Because of their high activity and lack of side effects, herbal plants play a significant role in treatment. The taxonomy distribution, colloquial names, phytoconstituents, morphology, pharmacological activity, medicinal applications, conclusion, and references of the plants were all examined in this review.*

I. INTRODUCTION

Linn. calls Euphorbia tirucalli (*E. tirucalli*).falling under the family Euphorbiaceae. It is a little tree or blooming shrub native to temperate regions. It gets its colloquial name, pencil tree, from its pencil-like twigs. According to studies, a number of plants in the Euphorbiaceae family are highly effective as medicinal agents. Their active chemical components may be separated and commercialised as novel medications. The plant portion that was employed was milky juice, which is purgative in moderate doses but emetic, counterirritant, and acrid in big doses. Pharmacological properties of *Euphorbia tirucalli* include antibacterial, anti-herpestic, and anti-mutagenic properties *Euphorbia tirucalli* contains a laxative that is used to treat skin tumours, cancer, sarcoma, cough, and asthma. Since there are 2000 species in the genus Euphorbia tirucalli, it is the second largest among the angiosperms. Pencil cactus plants have been utilised to cure piles. *Euphorbia tirucalli* is a type of succulent that grows in semi-arid tropical settings. It is also known by the names Pencil Cactus, Sticks on Fire, Aveloz, Naked Lady, and Pencil Tree. Native to Africa and India, the pencil cactus prefers soils with black clay.

Plant Profile – The tree is modest, about five metres tall, with smooth, cylindrical erect branches. A milky sap is released when a branch is severed. It is transformed into a phylloclade and polished whorled. Euphorbia tirucalli is also known as the pencil cactus because of the pencil-shaped branches on this plant. The colloquial name for the pencil cactus. Its white poisonous latex may be the cause of its low herbivore pressure and medicinal characteristics.



Fig 1. Euphorbia tirucalli (Pencil Cactus)

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II. TAXANOMIC DISCRIPTION

1) Common Names - Pencil Cactus, Indian Tree *Spurge*, Pencil tree, Milk Bush
2) Kingdom - Plantae
3) Division - Magnoliophyta
4) Class - Magnoliopsida
5) Order - Malpighiales
6) Family - Euphorbiaceae
7) Genus - Euphorbia
8) Species - Euphorbia tirucalli
9) Binomial Name - Euphorbia tirucalli
10) Plant Type - Shrub
11) Mature Size – 20-30 ft. tall, 6-10 ft. wide (outdoor), up to 6 ft. tall, 1-3 ft. wide (indoor)
12) Sun Exposure – Full
13) Soil Type – Sandy , well- Drained
14) Soil PH - Acidic , Neutral
15) Bloom Time – Spring , Summer
16) Flower Color – Yellow

III. VERNACULAR NAMES

Amharic: Kinchib;
Arabic: Knjil;
English: Finger euphorbia, Indian spurge tree, milk bush, naked lady, pencil-tree, rubber euphorbia;
Filipin: Bali bali;
French: Arbre de Saint Sebastien, Euphorbe effile euphorbe, Garde maison, Tirucalli;
Malay: Kayu patah, Tentulang, Tulang, Tulang-tulang;
Somali: Dana;
Spanish: Alfabeto chino, Antena, Esqueleto, Palito, Aveloz;
Swahili: Mtupa mwitu, Mwasi, Utupa;
Thai: Khia cheen, Khia thian;
Ugandan: Kakoni (luganda), Oruyenje (runyankole);
Vietnamese: San h(oo) xanh, X(uw) (ow)ng c(as)

IV. EUPHORBIA TIRUCALLI CONTAIN PHYTO-CONSTITUENT

1) Tirucallanes
2) Cyclotirucanenol
3) Cycloeuphordenol
4) Euphorginol
5) Lupeol

V. OCCURRENCE AND DISTRIBUTION

Although E. tirucalli is native to Africa and America, it has proven to be acclimatising and thrives freely throughout India, especially in the drier regions of Bengal and South India, where it has essentially grown up in hedges. It was created in Berar to protect immature mango trees from direct sunshine. Out of all the Euphorbia species, E. tirucalli is most likely the best-identified and most widely distributed species. The invention originated in the hot regions of East Africa and was common in places like Angola, Ethiopia, Eritrea, Malawi, Kenya, Rwanda, Mauritius, Sudan, Senegal, Uganda, Tanzania, and Zanzibar. It was uncommon in places like Brazil, Indonesia, India, Malaysia, Vietnam, and the Philippines. E. tirucalli grows naturally in many hot climates, usually in the abandoned sites of homesteads and kraals, where it forms broad, timbered trees that are eventually nurtured into forests.

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VI. MORPHOLOGY

1) *Whole plant :* E. tirucalli is a blooming shrub or small tree with straight twigs that can reach heights of 4–12 m and stem widths of 15–20 cm. It has polished, whorled, smooth, cylindrical, terete, and slightly thicker branchlets than a quill that bears during the rainy season.
2) *Leaves :* The tiny, linear-oblong, spotted, oblanceolate leaves measure between 1.3 and 2.5 cm in length and 2 cm in width. They are only close at the terminals of young branchlets, which are deciduous and grow very quickly. The tips of young, leafy branchlets are large and slightly tomentose, surrounded by spherical coffee hairs.
3) *Branches :* Branches are juicy, long, evergreen, and around 7 mm broad. They are usually curved in whorls.
4) *Stem or trunk :* When broken, the green, cylindrical, 0.5–2.0 cm-diameter fresh stems release milky exudates. The surface of dried stems has delicate longitudinal striations and is greenish brown in colour. Short and fibrous fractures are common. It has an unpleasant taste and an unremarkable smell. The stem's transverse section has a circular shape with few tiny notches caused by sunken stomata. The epidermal cells have a barrel-like form, thick cuticle covering them, and thin walls filled with rhomboidal calcium oxalate crystals.
5) *Powder :* The stem-bark powder has a yellow-brown colour. It displays pieces of lignified fibres, tracheids with bordered pits, epidermal cells with rhomboidal crystals of calcium oxalate, and parts of laticiferous canals. Under UV light at 366 nm, it exhibits a green colour with 1 N hydrochloric acid and a rust colour with concentrated acetic acid.
6) *Flowers :* The tiny, lovely, bottle-green flowers are thoughtfully grouped at the tips of little branches and organised in a group on terminal twigs. At the tip of the branchlets, there are two to six overloaded cymes. A thick cluster of cyathia that only increases in chap florets is produced by forking two to four times with heat applied for less than one millimetre. Typically, plants only produce male blooms. The bracteoles and perhaps a few chaps' flowers comprise the female involucres.
7) *Fruits :* When ripe, the fruit is a glabrescent capsule that sits on a tomentose pedicel that is up to 1 cm long, yellowish red, and easily falls off. Their tripartite capsule has a width of approximately 8–12 mm. While the capsules remain on the tree, they are dehiscing.
8) *Seeds :* The oval seeds measure approximately 3.0-4.0 (2.8-3.0) mm, are glabrous, velvety, and brown-spotted with a dark coffee ventral line surrounding the little, fair caruncle.
9) *Gum/latex :* Sap is utilised throughout the East African coast to bind spearheads to shafts and knife blades to timber handles due to its strong adhesive properties. Latex is a milky white sap that is caustic.
10) *Roots :* Plants create lateral roots so they don't get too deep.
11) *Wood :* The white wood has tight grains and is fairly stiff.

VII. PHARMACOLOGICAL ACTIVITIES

1) *Anti-Arthritic:* Sarang et al. [78] reported on the antiarthritic investigation of the biopolymeric fraction (BET) of E. tirucalli utilising an adjuvant-induced arthritis model in rats. The animal treated with BET exhibits a dose-dependent decrease in paw edoema. Up to 30 days after a dose of 400 mg/kg BET was administered, there were no obvious abnormal changes or deaths
2) *Anti-Helmintics :* Ten uncommon concentrations (0.1%–1.0%) of petroleum ether and dichloromethane-methanol extract of E. tirucalli's latex were shown to have anthelmintic activity against Pheretima posthuma earthworms. The time it takes for an earthworm to become paralysed and die in petroleum ether and dichloromethane-methanol extracts decreases for the entire test group.
3) *Analgesic :* Different extracts of E. tirucalli latex were tested for their analgesic efficacy utilising tail immersion and acetic acid-induced writhing procedures. The percentages of inhibition for the petroleum ether, dichloromethane-methanol, and aqueous extracts were 48.48%, 51.80%, and 57.67%, respectively. The number of writhes is significantly reduced ($P < 0.01$) when treated with 300 mg/kg of aqueous, 100 mg/kg of dichloromethane-methanol, and 30 mg/kg of petroleum ether extracts.
4) *Anti-Microbial :* All of the tested bacteria were inhibited by acetone extracts from the stem of E. tirucalli. It was discovered that E. coli was extremely sensitive to the acetone extracts of E. tirucalli. For C. albicans, the MIC was 500 µg, and for A. niger and A. fumigatus, it was 750 µg. Effective against B. subtilis, E. coli, P. vulgaris, S. aureus, A. niger, and C. albican sand, the chloroform extracts of the stem of E. tirucalli For P. vulgaris, 500 µg was the least inhibitory concentration, 500 µg for E. coli and S. aureus, 750 µg for B. subtilis and C. albicans, and 1000 µg for A. niger. A minimum inhibitory concentration of 500 µg was determined for E. coli and S. aureus, while it was 750 µg for B. subtilis, E. faecalis, and 1000 µg for C. albicans. The methanol extracts of the stem of E. tirucallishowed action against B. subtilis, E. coli, E. faecalis, and S. aureus. The extracts of petroleum ether and hexane exhibited no efficacy against the organisms under examination.

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5) *Anti-Bacterial:* Using agar diffusion and agar tube dilution assays, researchers investigated the antibacterial and antifungal effects of methanol, chloroform, n-hexane, and aqueous extracts from Sapindus emarginatus, Hibiscus rosa-sinensis, Mirabilis jalapa, E. tirucalli, Vitex negundo, and Saussurea lappa against B. subtilis, Escherichia coli (E. coli), Staphylococcus epidermidis bacterial strains, and Aspergillus flavus (A. flavus), C. albicans, and Candida glabrata fungal strains. Zone reduction by E. tirucalli n-hexane extract at 100 mg/mL is reported in the study's results.
6) *Anti-HIV :* The crude alcoholic extract of E. tirucalli's leaf and stem was subjected to HIV protease colorimetric assay for anti-HIV screening, and the results showed promising anti-HIV efficacy.
7) *Anti-Inflammatory :* By using carrageenan-induced mechanical hyperalgesia at dose levels of 30 and 100 mg/kg, the anti-inflammatory efficacy of euphol was evaluated. For additional analysis, the keratinocyte-derived chemokine, IL-1b, IL-6, and tumour necrosis factor-α associated with the suppression of myeloperoxidase activity were taken into consideration. Consequently, the result was validated to support the use of euphol in the treatment of inflammatory disorders.
8) *Antiviral :* Ramesh et al. used tobacco and tomato mosaic viruses to test the antiviral potential of petroleum ether and dichloromethane-methanol extract of E. tirucalli latex. There were three different extract concentrations used: 50, 100, and 150 ppm. At 150 ppm, petroleum ether extract demonstrated an 80% defence against tomato mosaic virus. At 150 ppm, the dichloromethane-methanol extract demonstrated 81% protection against the tobacco mosaic virus.

VIII. MEDICINAL USES

A. *Traditional Use*

1) *Whole plant :* It is helpful in treating leprosy, leucorrhea, and biliousness in India. It is used in Brazil to treat tumours, sarcomas, cancer, and cancroids.
2) *Latex :* The vesicant and rubefacient latex of E. tirucalli is used to treat rheumatism, warts, cough, asthma, toothaches, earaches, and neuralgia. In modest dosages, it functions as a purgative; in large doses, it is emetic, bitter, and irritating. Fish and rats are poisoned by latex. When taken in excess, milky juice can be emetic and an unpleasant counterirritant. It has a rubefacient exterior.
3) *Branches:* For sore throats, you can toast and chew on plant twigs. For colic and gastroenteritis, a decoction of branches is utilised. Ash can be used as a caustic to break up abscesses.
4) *Bark :* Bark is used in treatment of fractures.
5) *Stem :* Bone fractures can be repaired with poultices made from the stem.
6) *Root :* When treating gastralgia and colic, roots are used [5]. For women experiencing infertility or snakebite, boiled root liquid is an emetic [12]. In La Reunion, root is used as a vesicant and, less frequently, as an emeto-cathartic.
7) *Wood :* The wood is utilised for veneering, toys, and rafters. It is providing gunpowder with charcoal [7]. Decoctions made of wood are effective against leprosy and postpartum foot paralysis.

B. *Decorative Use*

Although they are often seen in homes and offices, potted E. tirucalli can also be grown in lawns.

IX. CONCLUSION

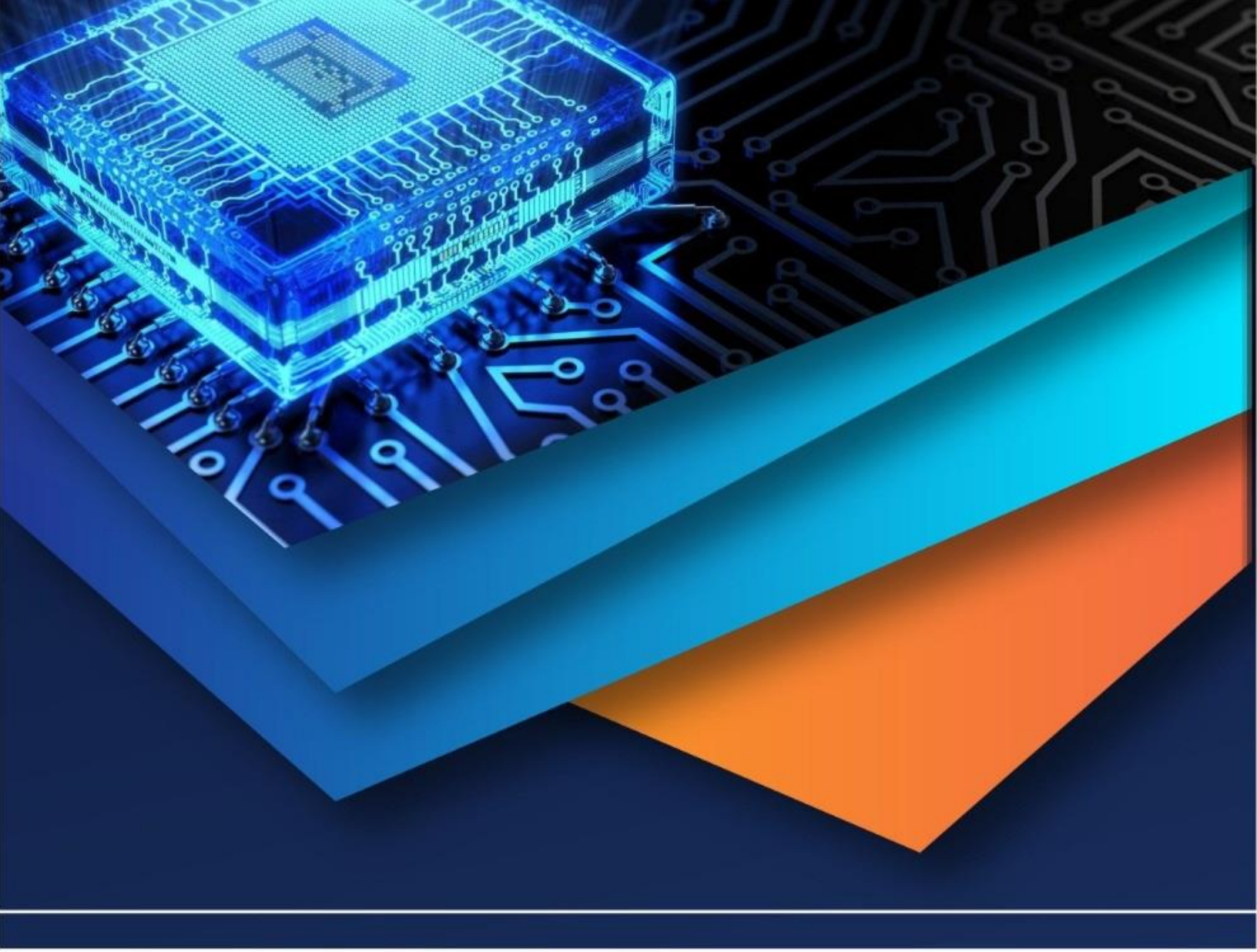
The majority of the pharmacological activities were carried out using in-vitro and in-vivo experimental approaches on the latex of E. tirucalli, according to the literature. Nevertheless, investigation of the molecular mechanisms underlying all of E. tirucalli's documented actions is necessary. Many additional phytoconstituents from the plant that have been isolated, structurally explained, and confirmed by advanced instrumental analytical techniques are still needed.

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