A HANDSOME APPROACH TO HANSEN’S DISEASE – HYDNOCARPUS PENTANDRUS (BUCH. -HAM.) OKEN: A COMPREHENSIVE REVIEW

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DOI: https://www.doi.org/10.56726/IRJMETS47021

ABSTRACT
This review discusses the botanical, ethnobotanical, phytochemical, pharmacological and ecological aspects of Hydnocarpus pentandrus (Buch.-Ham.) Oken. H.pentandrus is a medicinal plant prominent in Ayurveda for treating various skin disorders and Hansen’s disease. Belonging to the Achariaceae family, the evergreen trees are mainly found in the Western Ghats of India. The genus is named for its distinctive tuber-shaped fruit, and the presence of five androecium members. The paper highlights the various pharmacological properties like antioxidant, Anticancerous and antimicrobial activities of the plant. Ecologically, the tree is very significant, especially in its role as a host plant for butterflies and various hyphomycetes. Despite its ecological importance, the population of H.pentandrus faces decline owing to rapid urbanization. This review contributes to the overall understanding of H.pentandrus, promoting its medicinal and ecological significance.

Keywords: Hansen’s Disease, Chaulmoogra, Achariaceae, Native, Vulnerable.

I. INTRODUCTION
In the face of medical challenges, Hydnocarpus pentandrus emerges as a hidden gem. The genus Hydnocarpus belongs to the family Achariaceae, which includes about 31 genera and around 197 species of trees and shrubs that are distributed in tropical and subtropical regions of Africa, Asia, and the Americas (WFO, 2023). Predominantly found in moist deciduous and semi-evergreen forests up to 850 m in the Western Ghats, often near bodies of water. In India, it is most common in Maharashtra, Daman & Diu, Goa, Kamataka, Tamil Nadu and Kerala, but it is also cultivated elsewhere (BSI, 2023). The genus Hydnocarpus contains approximately 56 species worldwide, 5 of which are found in India: H.kurzii (King) Warb., H.alpina Wight, H.pentandrus (Buch.-Ham.) Oken, H.macrocarpus (Bedd.) Warb., H.pendulus Manilal, T.Sabu & Sivar. (WFO, 2023 ;BSI, 2001).

The genus Hydnocarpus gets its name from Greek roots, where "hydnon" denotes "a tuber/tubercle/truffle" and "karpos" denotes "a fruit," which refers to the fruit’s distinctive shape. Furthermore, the name "pentandrus" refers to the presence of five androecium members in the reproductive structure. The medicinal applications of Hydnocarpus can be located in ancient texts such as Charaka Samhitha (AD 100), Susrutha Samhitha (AD 600), Dwanwanthari Nighantu (AD1200), Nighantu Ratnakara, Kaiyadeva Nighantu, Osadhi Varga and Ashtanga Hrudaya (Sinha, 1996; Panday, 2001; Dogra et al., 2013). These sources emphasize the genus's effectiveness in caring for maladies such as Hansen’s disease, dermatological conditions, abdominal distension with constipation, hemorrhoids, sciatic conditions, cervical lymphadenitis, abdominal lumps, fever, itching, worm infestations, inflammatory skin diseases, metabolic disorders, partial intestinal obstructions and ulcers (Varghese et al., 2016).

1.1. Taxonomy
Throughout history, Hydnocarpus pentandrus' taxonomic nomenclature has been ambiguous, largely because of its specific epithet. Originally, Oken designated the specific epithet as "pentandra". However, Article 23.5 of the Shenzen Code necessitates that the specific epithet shares the gender of the generic name if it assumes an adjectival form. According to this taxonomic principle, this species hence gets its accepted name Hydnocarpus pentandrus.
1.1.1. Classification

Table 1: Classification according to APG IV system.

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Plantae</th>
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<tr>
<td>Clade</td>
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<td>Achariaceae</td>
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<td>Genus</td>
<td>Hydnocarpus</td>
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<td>Species</td>
<td>H.pentandrus</td>
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Table 2: Classification according to Bentham and Hooker system

<table>
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<th>Division</th>
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<td>Sub-division</td>
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<td>Class</td>
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<td>Polypetalae</td>
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<td>Series</td>
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<td>Order</td>
<td>Parietales</td>
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<td>Family</td>
<td>Flacourtiaceae</td>
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1.1.2. Synonyms:
*Chilmoria pentandra* Buch.-Ham.
*Hydnocarpus laurifolius* Sleumer
*Hydnocarpus wightianus* Blume
*Munnicksia laurifolia* Dennst.

1.1.3. Common Names

<table>
<thead>
<tr>
<th>Table 3: Common Names of <em>Hydnocarpus pentandra</em></th>
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<tr>
<td><strong>English</strong></td>
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<td><strong>Malyalam</strong></td>
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1.1.4. IUCN Status: VU (Vulnerable)

**II. METHODOLOGY**

The trees in Mumbai underwent an extensive and prolonged investigation to better comprehend their morphological features. This involved closely observing the trees and delving into past research to fill any gaps in the observed data. Published floras aided in identifying crucial tree traits and making comparisons with related species, while taxonomic databases were utilized to confirm tree identities and delve deeper into their classification.
III. RESULTS AND DISCUSSION

3.1 Description

Morphological description of the plant is given (Cooke, 1903; Singh & Karthikeyan, 2000; Almeida, 2009; Rao et al., 2019)

**Habit:** Evergreen trees, 5-25 m tall.

**Stem:** Trunk often fluted; bark brownish, rough; young parts brown pubescent

**Leaves:** Varied in form, leaves are either ovate-elliptic or elliptic-oblong or oblong to oblanceolate; base cuneate to obtuse, apex acuminate; margins subserrate; coriaceous; midrib pubescent; secondary veins 5 - 8 pairs; petioles 7 - 15 mm long, ferruginous pubescent; stipules linear, puberulous, caducous.

![Figure 3: Habit of H.pentandrus](image1)

![Figure 4: H.pentandrus (POWO, 2023)](image2)

![Figure 5: Leaves of H.pentandrus](image3)
Male flowers: Greenish, around 5-6 mm in diameter; racemose fascicles 3-6 in muber, each in 2–3 on top of a densely ferruginous tomentose peduncle; sepals uneven in length; The outer ones are oblong to elliptic-orbicular, while the inner ones are suborbicular; outer surface of sepals pubescent, inner glabrous; bigger than petals; Petals have ciliated margins, are concave, shape is oblong to suborbicular; Stamens 5, filaments filiform at first, progressively broader towards the base; anthers reniform, didynamous; base hairy. Heavily pilose, underdeveloped ovary.

Female flowers: 1 cm in diameter, either solitary or in pairs, on a common peduncle. Staminodes five in number. Ovary ovoid, pilose with a rich yellowish-pink color, beaked at the apex, and with 5 lobed stigma.

Fruit: Berries are globose, ovoid, tomentose, rigid, protruding at apex 5–7 cm in diameter; pericarp reddish brown, scurfy, tomentose. Seeds: 15–20, ovoid-oblong, longitudinally striated, immersed in pulp.

3.2 Anatomy:

Petiole: Petiole circular to ovate, epidermal cells barrel shaped, cuticle evenly thick, heterogenous cortex, collenchyma layer 15-25 cell thick, parenchyma 4-6 layered, vascular bundle single and collateral, bundle sheath is sclerenchymatous, crystals druces, unicellular, non-glandular trichomes present. (David, 2014)
Midrib: Plano-convex, adaxial surface bulged, epidermal cells orbicular to barrel shaped with an even cuticle, adaxial surface hemispherical, epidermal cells orbicular with a papillate cuticle. Cortex homogenous with prystamic, rosette and druces types of crystals, vascular bundle collateral, single, urn shaped. Sclerenchymatous bundle sheath. (David, 2014)

Lamina: Adaxial epidermal cells orbicular to barrel shaped, cuticle even, abaxial epidermal cells barrel shaped, cuticle even. Heterogenous mesophyll; veinlets circular; bundle sheath sclerenchymatous; crystals rosette and druces present. (David, 2014)

Stomata: Paracytic (David, 2014)

3.3 Ethnobotany

The *Hydnocarpus* plant, specifically its seed and seed oil, has played a significant role in medicinal practices throughout the annals of ancient Ayurvedic literature. Ancient texts including Susruts Samhita (13, 14), Caraka Samhita (30-124), Astanga Hrdaya (19-53, 39-84/85), Kaiyedeva Nighantu-osadhi varga (502-505), and Nighantu Ratnakara highlight the therapeutic significance of *Hydnocarpus*, which is mostly known for its effectiveness in treating Hansen’s disease and other skin disorders (David, 2014). Hortus Malabaricus mentions *H.pentandrus* for the treatment of vaginal diseases. (Rheede, 1678 – 1703) and Balakrishna's work in 2008 delineates the multifaceted uses of *Hydnocarpus* seed powder, paste, and oil. It encompasses ailments such as cholera, syncope, diabetes, eczema, itching, tuberculosis, and more (Balakrishna, 2008).

There is a story with reference to *Hydnocarpus* and leprosy. Due to leprosy, King Rama abdicated his throne at the ancient city of Varanasi. He wandered in the forests. There, he discovered the Kalaw tree, a *Hydnocarpus* tree whose fruits and leaves magically cured his sickness. Rama met Piya, an Indian princess exiled for leprosy, in his jungle isolation. Rama cured Piya with the Kalaw's healing power, and they got married. ((Wang & Wu, 1973)

A mixture of *H.pentandrus* oil and lemon juice is used for leprosy, skin burns and joint pains. Additionally, seed paste is used to alleviate skin disorders like eczema, white patches and itching in Aurangabad district of Maharashtra. (Zahid et al., 2013) The Mullu Kuruma and Kurichiya tribes utilise a combination of *H.pentandrus* oil and *Calotropis* leaf extract as an external treatment for scabies and hansen's disease (Silja et al, 2008;
Thomas & Rajendran, 2013). Besides Hansen's disease and scabies, the Mulla Kuruma tribes of the Wayanad district also use *H. pentandrus* for various other skin diseases (Chithra et al., 2016). Crushed Marotti leaf extract is specifically used by the Kurichya tribe in Kannur to promote hair growth and provide a cooling effect (Renjith & Ramachandran, 2010).

*Hydnocarpus* oil is used for massage in the Keralan martial art of *Klari*, a practice called *Tirumu* (David, 2014). Furthermore, *Vepu, Tulasi, Ummam*, and *Neela amari* in Marotti oil are included in a particular formulation for treating skin problems (David, 2014). Marotti is also used to cure a number of illnesses, such as ringworm, ulcers, wounds, psoriasis, obesity, sprains, and scabies (David, 2014). Marotti has a wide range of applications in veterinary medicine and agriculture in addition to medicine. In addition to this, in *Hortus Malabaricus* (Rheede, 1678–1703), it was used to treat illnesses in farmed animals. Oil from *H. pentandrus* and ash together worked well to treat wounds (David, 2014).

Marotti is well known in agriculture for its ability to function as both a manure and an insecticide. Its crushed fruit protects against Red Palm Weevil (*Rhynchophorus ferrugineus*) and Coconut Rhinoceros Beetle (*Oryctes rhinoceros*) in soil (Chandrika et al., 2000). A popular manure for coconut, rice, and vegetables is “marotti pinnakku”, a cake formed from beaten seeds or oil-cake. Crushed seeds protect coconuts from the Bud Rot disease, while the fruit rind’s smoke deters attacks by *Oryctes rhinoceros*. Marotti’s oil, seeds, and fruits help protect pepper, ginger, and turmeric crops from pests and diseases. Furthermore, in paddy farming, the marotti fruit cake improves soil fertility and helps manage nematodes (Baby & Manibhusanrao, 1993; David, 2014).

![Figure 13: Various products utilising *H. pentandrus*](https://www.irjmets.com/)

A & D- Chaulmoogra oil, B- Deep tissue balm oil, C- Chaulmoogra butter, E- Chaulmoogra soap, F- Oil free acne gel
3.4 Phytochemistry

The phytochemical profiles of *H. pentandrus* show a varied makeup of bioactive substances. Chaulmoogric acid and hydnocarpic acid were identified as important fatty acids in the seeds by Power and Barrowcliff (1908). *Hydnocarpus*’ fatty acids were subsequently identified as cyclopentanoid fatty acids by Badami and Patil (1980). A noteworthy finding by Blaise et al. (1997) was that 90% of the fatty acid composition of *Hydnocarpus* seed oil is made up of cyclopentenyl fatty acids.

![Figure 14: Fatty acid methyl esters of *Hydnocarpus* seed oil (Blaise et al., 1997)](image)

Rastogi and Mehrotra (1995) isolated epivolkenin and taraktophyllin, as well as ursolic, betulinic, acetylbetulinic, and acetylnursolic acid, from the stem bark of *H. pentandrus*. According to Sharma (2006), the seed hull contains flavonoids (luteolin, chrysoeriol, and apigenin), β-sitosterol, lupeol, β-amyrin, betulinic acid and siterol-β-D-glucoside.

Furthermore, spectral analysis and chemical degradations were used to identify two flavonolignans in the seed coats: hydnowightin and neohydnocarpin (Sharma et al., 1979). The leaf extract showed the presence of glycosides, carbohydrates, saponins and phenolics. (Krishnan et al., 2013). They also investigated the methanolic extract’s antioxidant activity. In their investigation of the ethanolic extract of *Hydnocarpus wightiana* Blume (syn. *Hydnocarpus pentandrus* (Buch.-Ham.) Oken), Reddy et al. (2013) identified substances including flavonoids, glycosides, carbohydrates, amino acids, luteolin and hydnocarpin that may have effects on the inhibition of α-glucosidase and the management of diabetic complications. In the roots of *H. pentandrus*, glycosides, flavonoids, carbohydrates, proteins, tannins, saponins, steroids and triterpenoids were reported. (Joshi and Kiran, 2014).

Two cyclopentenoid cyanohydrin glycosides, (1S,4R)-and (1R,4S)-1-[6-O-(α-L-rhamnopyranosyl)-β-D-glucopyranosyloxy]-4-hydroxy-2-cyclopentene-1-carbonitrile have been isolated. (Jaroszewski et al., 1988)

Along with chaulmoogric, hydnocarpic and gorlic acids, Cole and Cardoso (1938, 1939) also identified two homologs- alepric acid and aleprylic acids.

HPTLC analyses conducted on leaf and bark extracts, highlighted the presence of various compounds including alkaloids, essential oils, steroids, triterpenes, flavonoids, flavonoid glycosides, flavonolignans, phenolics, tannins and saponins (David, 2014; David and George, 2015).
3.5 Pharmacology

Antibacterial and antifungal activity:

The thorough investigation of *Hydnocarpus pentandrus* has provided vital information on its wide range of uses and medicinal qualities. By conducting thorough macroscopic, microscopic, and powder examinations on *Hydnocarpus pentandrus* seeds, Gupta et al. (2008) established thorough standards. According to studies by Kamat (2001), Garcia et al. (2012), Jacobsen and Levi (1973) and Oommen et al. (1999), the genus *Hydnocarpus* has significant antibacterial activity. It also shows promise in the healing of wounds and ulcers.

Samuel et al. (2010) reported that the seed extracts have significant antibacterial effectiveness against *Salmonella typhi*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Proteus mirabilis*. Kekuda et al. (2017) investigated the antibacterial activity of *H. pentandrus* leaves in detail. Their research found that a variety of bacteria, including *S. epidermidis*, *S. aureus*, *B. subtilis*, *E. coli*, *P. aeruginosa*, *B. cereus*, and *S. typhimurium* were inhibited. The leaf extract also showed antifungal activity against *Curvularia sp.*, *Alternaria sp.*, and *Fusarium sp.*, demonstrating its efficiency against both bacterial and fungal diseases.

Rajput and Bithel (2022) discovered a significant impact on the growth of *P. aeruginosa*, with inhibition occurring within 6-8 hours. Crucially, no further growth was detected after the extract was exposed to 1xMIC and 2xMIC concentrations. This observation directly implies the prolonged antimicrobial efficacy of *H. laurifolia* (syn. *Hydnocarpus pentandrus* (Buch.-Ham.) Oken) seeds, emphasizing their potential as a potent agent against *P. aeruginosa*.

To address the susceptibility of the raw oil to oxidation, Bains et al. (2023) formulated a specialized nanohydrogel, demonstrating potent antibacterial and antifungal activity. Additionally, Rajput and Bithel (2022) identified the seed’s ethyl acetate extract as a promising antimicrobial and antibiofilm agent, showcasing its potential against various pathogens.

Antioxidant activity:

Shyam et al. (2013) and Reddy et al. (2005) both emphasized the antioxidant properties of *H. pentandrus* seeds. Reddy et al. (2005) confirmed this by verifying the seeds’ substantial ability to effectively scavenge radicals.

Anticancer activity:

Sharma and Hall (1991) reported the cytotoxic effects of flavonolignans, specifically hydnovightin, hydnocarpin and neoehydrocnocarpin, on murine and human cell lines. Hydnocarpin has shown potential for T cell acute lymphoblastic leukemia (T-ALL) therapy, demonstrating a multi-faceted approach by inducing cell cycle arrest, apoptosis and cytotoxic autophagy, ultimately triggering ferroptosis (Lou et al., 2021).
Kumar et al. (2018) showcased the capability of *H. pentandrus* leaves extracts to produce stable silver nanoparticles with considerable antioxidant and anti-cancer activities. The biosynthesized AgNPs showed considerable antioxidant activity and excellent anti-cancer activity against breast cancer cells (MCF-7).

**Antidiabetic activity:**
Ethanol and acetone extracts are reported to show antidiabetic and antioxidant activity, respectively (Reddy et al., 2013). The research conducted by Reddy et al. (2013) strongly advocates the integration of alpha-glucosidase inhibitors in the treatment of type 2 diabetes. Their study specifically focuses on the ethanolic extract of *Hydnocarpus wightiana* (syn. *Hydnocarpus pentandrus*) (Buch.-Ham.) Oken. The findings highlight the significant reduction in plasma glucose levels achieved by this extract, comparable to the established medication Acarbose. Moreover, the plant exhibits inhibitory activity against α-glucosidase, suggesting its potential efficacy in managing hyperglycemia and preventing complications associated with diabetes.

**Pesticidal activity:**
Nanoemulsion produced from *H. pentandrus* seed oil has a potential as a biopesticide for controlling *Sitophilus oryzae* (Jaganathan et al., 2020).

### 3.6 Hydnocarpus and Hansen's disease

Leprosy is a disease caused by the bacillus *Mycobacterium leprae*. It is also called Hansen’s disease after the Norwegian physician Gerhard Armauer Hansen, who in 1873 discovered that the disease was caused by the bacillus *Mycobacterium leprae*. It is a highly contagious disease, affecting the skin and peripheral nerves which leads to permanent disabilities (Lastória & Abreu, 2014). Leprosy has two main types with many intermediates in between- Tuberculoid leprosy and lepromatous leprosy. (Küstner et al., 2006; Dey & Nath De, 2012)

Chaulmoogra oil derived from *H. kurzii* and *H. pentandrus* has been used to treat leprosy since ancient times. In modern times there have been cases reported of it helping the patients. (Cottle, 1879; McCoy, 1942; Parascandola, 2003)

Apart from India, Chaulmoogra oil is a traditional remedy for leprosy in Hawaii as well. (Norton, 1998) Initially, the oil was applied topically, directly onto the ulcer. Mouat put it to the test internally by giving his patients tablets made from ground-up seeds. The condition could only be partially cured by external treatment; internal application was more successful but was poorly absorbed by the body, leading to nausea, vomiting and diarrhoea. (Parascandola, 2003; Santos et al., 2008)

In the early 1900s the oil was introduced for administration through subcutaneous or intramuscular injections. These injections were extremely painful, causing both local reactions and fever in patients, but they also eliminated the nausea that came with oral administration. Eventually, Dr. Victor Heiser discovered a way to decrease the pain and irritation caused by the injections. The addition of camphor to the mixture of chaulmoogra and resorcin enhanced the absorption of the chaulmoogra. (Parascandola, 2003; Santos et al., 2008)

Injections administered intramuscularly were shown to be less efficacious than injections administered intradermally. When the drug was administered intramuscularly, only its general effect was observed. However, when it was injected into skin lesions, the localized impact combined with the general effect, and it’s possible that this process even enhanced the general effect. (Muir, 1932)

In a study by Levy in 1975, the sodium salts derived from chaulmoogra oil, along with hydnocarpic and chaulmoogric acids, demonstrated effectiveness in treating *Mycobacterium leprae*-infected mouse footpads. The administration of these compounds through intraperitoneal and subcutaneous routes three times per week proved to be successful. The ability of chaulmoogra oil to stimulate host lipases, resulting in the degradation of foreign lipids like the *Mycobacterium leprae* cell wall, may explain its anti-leprosy efficacy. This mechanism may enhance bacterial penetration through the cell wall, allowing normal immune responses to destroy the pathogen. Another potential method is chemotaxis. Furthermore, cyclopentenyl fatty acids found in chaulmoogra oil may impede biotin co-enzyme activity or microbial biotin synthesis, providing numerous avenues for its antileproptic action. (Jacobsen & Levy, 1973; Norton, 1998; Sahoo et al., 2014)

Even with its advancements, chaulmoogra was not a perfect leprosy cure. Due to side effects, the course of treatment was prolonged, and its efficacy was disputed. The drug’s effectiveness was supported by a large
number of studies in the literature, although many doctors had doubts about its potential therapeutic benefits. The introduction of sulfones as a leprosy treatment in the 1940s brought Chaulmoogra to an end. Additionally, the use of sulfones led to the eventual transition of leprosy patients from isolation to outpatient care. As a result, by the 1950s, the treatment utilising Chaulmoogra was completely abandoned. (Parascandola, 2003; Santos et al, 2008)

3.7 Biofuel

Biodiesel, derived from raw *Hydnocarpus pentandrus* oil through transesterification with methanol and a base catalyst, exhibits optimal performance at a nozzle pressure of 250 bar and a static injection timing of 20° bTDC. When compared to neat diesel, the use of neat *Hydnocarpus pentandra* Oil Methyl Ester (MOME) in a diesel engine results in lower emissions of hydrocarbons and nitrogen oxides across all loads during steady-state conditions. (Karthikeyan et al., 2014)

An economically viable biodiesel made from low-cost feedstock, such as dairy waste scum oil and *Hydnocarpus wightiana* (syn. *H. pentandrus*) oil, can be used as an alternative fuel in current diesel engines without requiring any modifications. (Krishnamurthy et al., 2018)

3.8 Ecology

*Hydnocarpus*, a versatile genus, exhibits a widespread distribution encompassing various ecosystems, including forests, sea shores, marshy areas, rural and urban landscapes (David, 2014). It holds particular ecological significance as a crucial component in delicate ecosystems such as sacred groves, protected areas, and national parks, necessitating conservation efforts. The genus’s adaptability spans diverse geographical terrains, from plains to elevated altitudes, with *H. pentandrus* demonstrating maximum adaptability within the genus (David, 2014).

Notably, observations by Babu in Karunagappally and Manu in Kottayam identified *Hydnocarpus* as a host plant for butterflies, with Mathew (2011) reporting that *Cirrochroa thais thais Fabricius*, the Tamil Yeoman Butterfly, relies on *H. pentandrus* and *H. alpina* as host plants for its larvae. Mathew and Mohandas (2001) had previously reported *H. pentandrus* as the host plant in the Shola Forests. The selection of *Hydnocarpus* as a host plant is attributed to the presence of cyclopentanoids, chemicals that attract males, and the plant’s cyanogenic ability to produce hydrogen cyanide, providing larvae with a protective mechanism against predators (Clausen et al., 2002).


However, despite its ecological importance, the population of *Hydnocarpus*, especially *H. pentandrus*, is dwindling due to the adverse impacts of rapid urbanization (David, 2014). This decline, particularly in lowland and midland areas, poses a threat to the persistence of *H. pentandrus*.

### IV. CONCLUSION

*Hydnocarpus pentandrus* is a botanical treasure with far-reaching implications in medicine, culture and the environment. Due to its diverse chemical makeup and extensive pharmacological profile, it serves as a foundation for the development of novel drugs. Figure 15 showcases some of the products in the market utilising *H. pentandrus*.

The traditional knowledge and ecological links highlight the importance of its long-term conservation efforts. *H. pentandrus* is an example of the strong link between nature, traditional knowledge, and present scientific study in phytochemical, medicinal, ethnobotanical, and ecological domains. The challenges that it faces as a result of urbanisation highlight the importance of taking proactive conservation steps to protect this precious biological resource for future generations.
DECLARATION

This paper features Anushka Agarwal and Harshwardhan Gupta as co-first authors. The contributions of the co-first authors were deemed equivalent, and therefore they are listed in alphabetical order.

CONFLICT OF INTEREST

We hereby declare that there is no potential for conflict of interest among the authors and that the work complied with all applicable ethical guidelines.

V. REFERENCES


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Malabarici apud Indos cereberrimi onmis generis plantas rariores, Latinas, Malabaricis, Arabicis, Brachmanum characteribus hominibusque expressas ... sumptibus Johannis van Someren, et Joannis van Dyck. https://doi.org/10.5962/bhl.title.707


