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# A SCOPING REVIEW ON NUTRITIONAL, PHYTOCHEMISTRY, PHARMACOLOGICAL ASPECTS, MEDICINAL APPLICATION AND TECHNICAL KNOWLEDGE ON THE NATURAL RESINS

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## ABSTRACT

Natural resins, a diverse class of plant-derived substances, have garnered increasing attention due to their nutritional, phytochemical, pharmacological, and medicinal properties. This scoping review aims to comprehensively explore the multifaceted aspects of natural resins, focusing on their nutritional value, chemical composition, therapeutic potential, and technical applications. Resins from conifers often include resin acids, a mixture of diterpenic organic carboxylic acids. This study systematically analyze the phytochemical constituents of various natural resins, highlighting key bioactive compounds such as terpenoids, alkaloids, flavonoids, and phenolics, which contribute to their pharmacological activities. In terms of medicinal applications, these resins have shown promising effects in the treatment of ailments ranging from inflammation and infections to digestive and respiratory disorders. Furthermore, the review delves into their utilization in traditional and modern medicine, including their role in wound healing, antimicrobial treatments, and as anti-inflammatory agents. The technical knowledge regarding the extraction, and optimization of resin-based products is also discussed to provide insights into their industrial and therapeutic applicability. Through this review, we aim to consolidate existing knowledge on natural resins and highlight their potential for future research and development in both medical and industrial sectors.

**KEYWORDS:** Natural Resins, Oleo gum Resins, Phytochemistry, Pharmacological Properties.

## INTRODUCTION

Non-wood forest products (NWFPs) are classified according to their chemical composition as natural resins, natural gums, or gum resins. Natural resins are solid or semi-solid substances that often include a complex combination of chemical components known as terpenoids. These compounds are typically insoluble in water but can dissolve in certain organic solvents. Resins are released by numerous plants, especially coniferous trees, and are used to produce varnishes, adhesives, and food glazing agents.[1]

India is home to many tree species that generate gums and resins. Some of these are of local or limited relevance, others are widely utilized throughout the country and have also found their way into the export market. Gum karaya, gum ghatti, salai gum, guggul, and gums from various Acacia species, such as Indian gum Arabic from Acacia nilotica and real gum Arabic from Acacia senegal, are examples of commercially valuable gums and gum-resins produced from woodlands. Key commercial resins come from groups such as Pinaceae (rosin, amber), Leguminosae (copal), and Dipterocarpaceae (dammar). The United States Food and Drug Administration has approved several natural gums and resins for use in food and medicinal goods. There is no known allergies associated with natural resins. Today, natural gums and resins are widely utilized across various manufacturing sectors, including the food and pharmaceutical industries, for numerous applications.[2]

Resins are oxidation products derived from various essential oils, exhibiting a complex and diverse chemical makeup. They are typically secreted in specific cavities or channels within plants, often oozing through the bark and hardening when exposed to air. In many cases, tapping the tree is necessary to obtain commercially viable amounts of resin. Commercial resins can also be extracted from fossil sources. Resinous substances can exist alone or in conjunction with essential oils or gums. Resins, unlike gums, are insoluble in water but readily dissolve in solvents like ether and alcohol.

Resins possess unique properties that make them valuable in industry. Their gradual hardening as the contained oils evaporate is essential for producing

varnishes. When resins are dispersed in solvents and applied to surfaces, evaporation of oils and solvents leaves a thin, waterproof resin layer. This has made resins useful for waterproof and decorative coatings throughout history. Another industrially important property of resins is their solubility in alkalis, allowing them to be used in soap production. Additionally, resins find applications.[3] Resins are oxidation products derived from various essential oils, exhibiting a complex and diverse chemical makeup. They are typically secreted in specific cavities or channels within plants, often oozing out through the bark and hardening when exposed to air. In many cases, tapping the tree is necessary to obtain commercially viable amounts of resin. Commercial resins can also be extracted from fossil sources. Resinous substances can exist alone or in conjunction with essential oils or gums. Resins, unlike gums, are insoluble in water but quickly dissolve in solvents such as ether and alcohol.

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The main characteristics of resins are as follows.

- They do not dissolve in water.
- They dissolve in ordinary solvents including alcohol, ether, and turpentine.
- Resins are brittle, amorphous, and either clear or semi-transparent.
- They have a peculiar shine, are often fusible, and emit a smoky flame when burnt.[5]

**Gum-resins**: Gum-resins are natural combinations of gum and resin that display the properties of both. They include modest amounts of essential oils and color pigments and are frequently secreted by plants in arid regions. The most often used gum-resin comes from the Boswellia serrata tree, also known as salai guggul.

**Oleo-gum resins:** Oleo-gum-resins are semi-solid plant extracts made up of a homogenous mixture of volatile oil, gum, resin, and trace amounts of other ingredients. Oleo-gum resins include guggul and asafoetida. Natural resinous gums (NRGs) have numerous applications in medicine, as well as in meeting socio-cultural, spiritual, and health demands in communities. Locals employ medicinal formulations created from tree gums and resins to treat injuries, neurological problems, and a variety of other ailments.[6]

**Table 1: Essential resins and gums used in traditional medicine.**

| S. no. | Plant name | Family | Common name | Part used | Ailment cured |
|---|---|---|---|---|---|
| **1.** | Kerria lacca | Tachardiidae | Lac insect | Resin | Dysentery, diarrhea, internal bleeding issues, intestinal parasites, cough, hiccups, jaundice, obesity, skin diseases, leprosy, kidney and spleen abnormalities, back discomfort, joint troubles, ulcers, epilepsy, and chicken pox. |
| **2.** | Canarium strictum | Sapindaceae | Black dammar | Resin | Dysentery and Diarrhoea. |
| **3.** | Shorea robusta | Dipterocarpaceae | Sal | Resin | Itching and rashes, excessive sweating, aggravated pitta-related Wounds, ulcers, nerve pain, burns, itching (pruritus), fractures, fever, diarrhea, dysentery, hemorrhoids, gonorrhea, heavy menstrual bleeding (menorrhagia), enlargement of the spleen, obesity, headaches, toothaches, burning sensation in the eyes, and eye pain. |
| **5.** | Vateria indica | Dipterocarpaceae | White dammar | Resin | Cough, chronic bronchitis, throat difficulties, skin rashes, leprosy, cracked skin infections, ulcers and sores. |
| **6.** | Gardenia resinifera | Rubiaceae | Dikamali | Resin | Headache, runny nose, intestinal parasites, abdominal bloating, and hemorrhoids. |
| **7.** | Pinus spp. | Pinaceae | Chir, Blue, and Khasi pines | Resin | Wounds, bloat |
| **8.** | Boswellia serrata | Burseraceae | Indian frankincense | Gum-resin | Rheumatoid arthritis, asthma, inflammatory bowel disease, and skin diseases. |
| **9.** | Commiphora wightii | Burseraceae | Guggul | Oleo-gum resin | Joint pain, blood clots, persistent bronchitis, cystic acne, swollen gums, and tooth decay. |
| **10.** | Convolvulus scammonia | Convolvulaceae | Sakmonia | Gum-resin | Dropsy |

Sal Tree (Shorea robusta), Indian Frankincense (*Boswellia serrata*), Indian Bdellium Tree (Commiphora wightii), Neem Tree (Azadirachta indica), Indian Copal Tree (Vateria indica), Pine Trees (Pinus species), Ailanthus Tree (Ailanthus triphysa), Indian Myrrh Tree (Commiphora myrrha), Sandalwood Tree (Santalum album), Acacia Trees (Acacia seyal and Acacia senegal) are the primary species in the country known for producing gums and resins. Copal, Dammar batu, Gum rosin, Lac, Mastic gum, Asafoetida, Myrrh, Olibanum or frankincence.[7] Nutritional, Phytochemistry, Pharmacological aspects, Medicinal Application and Technical Knowledge on all the Resins.

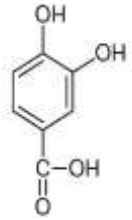
- **Acacia seyal:** The genus *Acacia* (commonly referred to as wattles) includes a vast variety of shrubs and trees that are members of the subfamily Mimosoideae within the pea family (Fabaceae). These plants are native to tropical and subtropical regions across the globe.[8]

Acacia seyal is a renowned traditional medicinal plant with different therapeutic benefits, due to its various phytoconstituents present in both its organized portions, such as fruits, bark, stem, and roots, and unorganized parts, like gum acacia, also known as "taleh" or "talha gum."[9]

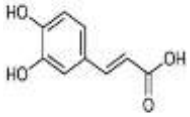
**Figure 1: Acacia Seyal Resins.**

**Main Phytoconstituents**

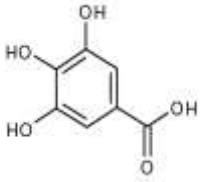
The chemical composition of *Acacia seyal*, including its primary phytoconstituents, has been documented in previous studies. This composition can vary based on factors such as the tree's geographical origin, age, climate, and soil conditions. A. seyal's leaves, flowers, and pods contain high levels of phytochemicals such as proteins, saponins, phenolics, flavonoids, anthocyanins, and carbohydrates. Notably, the bark extract lacked alkaloids and anthraquinones. Other investigations have discovered flavonoids, saponins, terpenoids, steroids, alkaloids, phenols, coumarins, and tannins in stem bark. The leaves of A. seyal also contain phenolic acids such gallic acid, salicylic acid, p-coumaric acid, caffeic acid, 3,4-dihydroxybenzoic acid, and ferulic acid.[8]



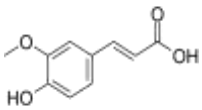
**3,4-dihydroxybenzoic acid**



**Caffeic acid**



**Gallic acid**



**Ferulic acid**

**Pharmacological aspects of Acacia:** Acacia species' pharmacological qualities have been widely explored. Secondary metabolites from these species display different biological properties, including antibacterial, antifungal, antioxidant, anticancer, antiparasitic, antidiabetic, immunomodulatory, and cytotoxic effects.

**Nutritive Value:** Acacia seyal gum primarily consists of a complex polysaccharide with a minor proportion of nitrogenous compounds, including proteins. While its nutritional value as a digestible polysaccharide is low, it is highly valued for its significant content of soluble dietary fibers. These polysaccharides have little caloric value and are resistant to digestion by digestive enzymes, making them beneficial for dietary fiber intake.[10] Acacia seyal gum's soluble dietary fibers inhibit sugar and fat absorption, which contributes to its antihyperglycemic and antihyperlipidemic properties.[11]

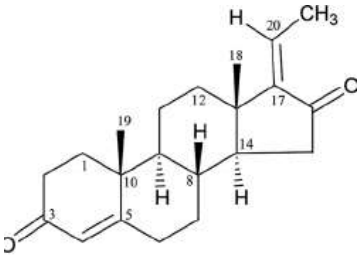
- **Indian Bdellium Tree (Commiphora wightii)**

*Commiphora wightii*, also known as the Indian bdellium tree, Gugal, Guggul, or Guggulu, is a flowering plant in the family Burseraceae. While it is found throughout northern Africa and central Asia, it is most common in northern India. This plant thrives in dry and semi-arid locations and may grow even in poor soil conditions.

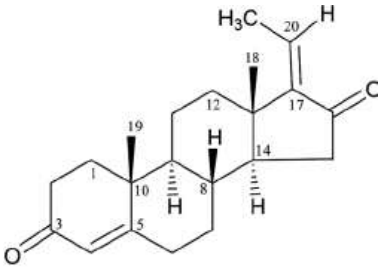
It is a shrub or small tree that can grow to be up to 3 meters tall and has thin, papery bark. C. wightii produces a resinous substance called gum Guggul, and its extract—known as gugulipid or guglipid—is frequently utilized in Ayurvedic medicine. The plant's composition includes essential oils, resin, gum, and bitter compounds.

**Fig 2: Commiphora wightii.**

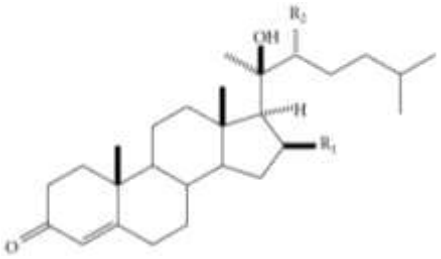
**Chemical Constituents:** Volatile oil containing myrecene, dimyrecene, and polymyrecene; resin (Z-Guggulsterone, E-Guggulsterone, Z-Guggulusterol, and Guggulusterol I–V).[12]



**Z-Guggulsterone**



**E-Guggulsterone**



**Guggulusterol I**

**Nutritive Value:** Guggul is an oleo gum resin obtained from the Burseraceae family plant, Commiphora wightii. It is composed of 61% resin, 29.3% gum, 0.6% volatile oils, 6.1% moisture, and 3.2% impurities.[13]

**Chemical composition of Guggal:** Guggul gum contains 61% resin, 29.3% gum, 6.1% water, 0.6% volatile oil, and 3.2% foreign materials. Derived from the gum-resin exudate of the plant Commiphora mukul, it is a complex mixture that includes steroids, diterpenoids, aliphatic esters, carbohydrates, various inorganic ions, and small amounts of sesamin, along with other unidentified components.[14]

**Pharmacological Activity**

Guggul's pharmacological properties have been extensively studied for decades, with ongoing research since 1979. Over the years, it has shown effectiveness in addressing a wide range of health conditions. Guggul is reported to help cure nervous system problems, hemiplegia, leprosy, marasmus, muscle spasms, neuralgia, ophthalmia, pyelitis, pyorrhea, scrofula, skin ailments, spongy gums, ulcerative pharyngitis, hypertension, ischemia, hemorrhoids, and urinary tract infections.

Its antioxidant properties have an important role in suppressing cholesterol oxidation, avoiding arterial hardening, reducing platelet stickiness, and lowering the risk of coronary artery disease. Furthermore, guggul enhances the elimination of bile acids (cholic and deoxycholic acids) and cholesterol through feces while reducing the intestinal absorption of fats and cholesterol.[15]

- **Indian Copal Tree (Vateria indica)**

This tree species is slow-growing and typically found in the canopy or emergent layer of evergreen forests at low to medium altitudes. It has smooth bark in shades of gray, with stems and trunks displaying a blend of green, gray, and white. The plant is notable for its dense foliage and fragrant white flowers, which attract honey bees for pollination. Found throughout Kerala, this genus is highly valued for its durable timber. Furthermore, its resin is prized for its medicinal tonic and expectorant properties, as well as its role in producing adhesives.

**Fig 3: Vateria indica Resins.**

**Chemical Constituents**

The leaves and roots of *Vateria indica* are rich in bergenin and hopeaphenol, while the bark contains bioactive components include oligostabinoids and monoterpenes. The resin contains a complex mixture of triterpenes, hydrocarbons, ketones, alcohols, acids, and trace amounts of sesquiterpenes. The outer layer of the plant (epicarp) is notable for its high tannin content, around 25%. Commonly known as pine fat or dhupa fat, *Vateria indica* produces dhupa oil, which contains more than 55% saturated fatty acids and solidifies at lower temperatures, resembling a fat-like texture.

The dhupa nut contains 19-23% fat, which results in a light-yellow material with a tallow-like consistency that whitens with time. The main fatty acids found in dhupa fat are stearic acid (38-47%), oleic acid (38-48%), and palmitic acid (up to 95%). In addition, the seeds contain bergenin. The phenolic components of Vateria indica have identified five tetramers: resrarol, Vateria phenol B and C, isohopéphonol, Espoir phenol, and coast.[16]

**Pharmacological Activity**

Pharmacological properties of *Vateria indica* evaluate the anti-inflammatory effects of *Vateria indica* leaves. The plant is also used to treat worms, ulcers, and inflammation. Furthermore, the stem bark of Vateria indica demonstrates substantial antitumor potential, and the plant is recognized for its overall anticancer characteristics.[17]

- **Indian Myrrh Tree (Commiphora myrrha)**

The Commiphora species are tiny trees or shrubs with rough, thorny branches. True myrrh is largely derived from the Commiphora myrrh plant, which is endemic to southern Arabia, northeastern Africa (particularly

Somalia), and northeastern Kenya. Other resin-producing Commiphora species can be found in Sudan, southern Arabia, Eritrea, Kenya, Ethiopia, and Somalia. Commiphora species are little trees or shrubs with spiky branches and bark that emits a pale gray discharge or reddish-brown resin.

**Fig 4: Commiphora myrrha Resins**

**Myrrh:** Myrrh is an oleo-gum resin derived from various *Commiphora* species. Its composition includes 3–4% impurities, 7–17% volatile oils, 25–40% alcohol-soluble resins, and 57–61% water-soluble gum. The alcohol-soluble components of myrrh resin include commiphorinic acids, commiphoric acids, commiferin, heerabomyrrhols, and heeraboresene.[18]

**Phytochemical Constituents**

**Volatile Oil (7–17%)**

Contains components include cuminic aldehyde, eugenol, meta-cresol, pinene, limonene, diterpenes, and two sesquiterpenes.

**Resin (25–40%)**

- The ether-soluble portion contains α, β, and γ commiphoric acids, esters of another resin acid, and two phenolic resins.
- Ether-Insoluble Portion*:* Composed of α and β heerabomyrrholic acids.

**Gum (57–61%)**

Associated with the enzyme oxidase and hydrolyzes to produce arabinose.

**Essential Oil of *Commiphora***

Contains nine sesquiterpene hydrocarbons, elemol (a sesquiterpene alcohol), and furanosesquiterpenoids including furanodiene, furanodienone, isofuranogermacrene, curzerenone, and lindestrene.
Includes 3–4% impurities.

**Pharmacological Activity**

Myrrh's effects include creating muscle, decreasing swelling, relaxing discomfort, and dispersing stasis. It is used to treat rheumatic arthralgia, postpartum stasis, dysmenorrhea, gynecological benign tumors, trauma, abscess, swelling, and wounds, as well as chest arthralgia and grief.[19]

- **Pine Trees (Pinus species)**

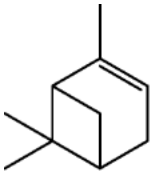
Pinus roxburghii Sarg. (Pinaceae), popularly known as chir pine, is a tall tree with a spreading crown that grows in the Himalayas from Kashmir to Bhutan, Afghanistan, and the highlands of southern India.

It is also grown for aesthetic purposes in gardens. Tapping the stem produces a transparent, translucent oleo-resin with a strong, bitter flavor. The distillation of turpentine oil from oleo-resin leaves yields a translucent, slightly aromatic rosin (colophony). It is used in the manufacturing of fireworks, insecticides, and disinfectants. It also finds its way into some lubrication solutions, hair fixants, and nail polishing solutions. It frequently causes contact allergies, although it is also used to make ointments, plasters, and a variety of other items like chewing gum, polishes, and varnishes.[20]

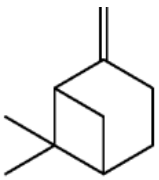
**Fig 5: Pinus roxburghii Resin.**

**Phytoconstituents**

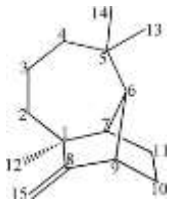
The oil consists of α-limonene, α-phellandrene, borneol, longifolene, and α-cadinene. Chir oleoresin is the primary source of turpentine oil in the country. The normal composition consists of α-pinene (20-30%), β-pinene (5-10%), β-3-carene (55-65%), and longifolene and other terpenes (2-10%). β-carene, β-longifolene, and longicyclene have also been detected. Additionally, the bark contains 7-10% tannins.[21]



α-pinene



β-pinene




β-longifolene

- **Pharmacological Activity**
- P. roxburghii's wound healing activity was investigated, while methanol and aqueous extracts of P. longifolia leaves were tested for wound healing activities on excision and incision wound models.

Additionally, their cytotoxicity, antimicrobial, and antibacterial properties were evaluated.[20]

➢ **Sandalwood Tree (Santalum album)**

The plant was primarily used to generate aromatic sandalwood oil by steam distillation. A little, glabrous, evergreen tree with slender, drooping branches produces odorless, white sapwood. The yellowish brown heartwood has a strong odor. The elliptic lanceolate, subacute glabrous, entire thin base sharp leaves are 3.8 to 6.3 by 1.6 to 3.2 cm long. The petioles are 1 to 1.3 cm long. The thin, reddish purple induorous flowers grow in terminal and auxiliary paniculate cymes that are shorter than the leaves. 4 rounded obtuse scales alternate with 4 perianth campanulated limbs, 4 valvate triangular segments, and 4 stamens.

Globose-shaped, measuring 1.3 cm in diameter. Purple-black endocarp; hard-ribbed fruit conelaed, pea-sized, spherical, crowned with rim-like remnants of the perianth tube, smooth, nearly black, bearing a solitary seed.

**Fig 6: Santalum album Resins.**

**Phytoconstituents**

The oil's major constituent, santalol (90 percent or more), is a blend of two main sesquiterpene alcohols, C15H24O, notably α-santalol (bp-166- β-santalol (b.p-177-1780C), where the α-form is more abundant, and 1670C). (1, 3). Sandalwood oil has approximately a hundred components classified as tannins, terpenes, resins, and waxes. These include the hydrocarbons santene (C9H14), nortricyclo-ekasantalene (C11H18), α- and β- santalenes (C15H24), alcohols-santenol (C9H16O), teresantalol (C10H16O), aldehydes-nor-tricyclo-kasantalal (C11H16O), 3, 7, 8, and acids α- and β- santalic acids (C15H22O2) and teresantalic acids (C10H14O).

**Pharmacological Activity**

Antibacterial Activities of oil & bark, Skin cancer- and chemo preventive efficacy of αSantalol, Antioxidant activity, Anti-ulcerogenic activity.[22]

➢ **Benzoin Resin (*Styrax benzoin*)**

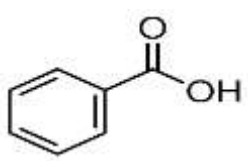
There are various names for styrax benzoin depending on where you live. Benzoin trees, benzoin resins, and sumatra benzoin are some of the common names for Styrax benzoin. The plant, which can be either a shrub or a tree, is about 25 meters long, 30 centimeters in diameter, and has simple, hairy, dark green leaves with white flowers. Since ancient times, people have been familiar with the scent of benzoin resins, which are employed as perfumes or medicines in all cultures worldwide.

The resin varies greatly between species and cultivars and is believed to be influenced by a variety of factors, including genetics, growing conditions, geographic origin, distinct chemotypes, and variations in the plants' nutritional state.

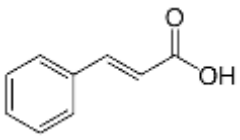
Styrax benzoin resins are made by tapping the bark, which takes 15 to 20 years to create. When obtained, styrax benzoin resins are yellow, but when they thicken and harden, they turn reddish-brown.

**Fig 7: *Styrax benzoin Resin***

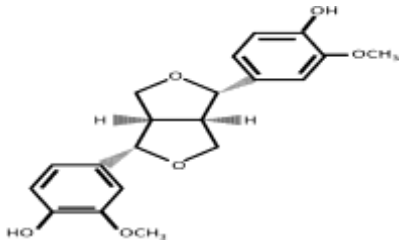
**Phyto-chemistry:** The presence of vanilline gives styrax benzoin a vanilla-like aroma. Styrax benzoin is used to produce trans-coniferyl alcohol benzoate or trans-p-cumaryl alcohol. Styrax benzoin contains several chemicals, including cinnamic acid, benzoic acid, methyl cinnamonate, coniferyl benzoate, cinamic acid, phenylethylene, and vanillin.




**Benzoic acid**




**Cinnamic acid**




**Pinoresinol**

**Pharmacological Activity**

Phytotherapy in dermatology: Dermatology using phytotherapy. The process of repairing plant-based medications and using them to treat skin conditions is known as phytotherapy in dermatology. Both skin conditioning and skin toughening are accomplished using benzoin.

Issues with the respiratory system: Numerous respiratory issues exist, including aspiration, obstructive sleep apnea, asthma, pneumonia, and chest infections.

A diuretic: Kidney disorders, heart failure, cirrhosis, nephritic syndrome, and excess extracellular fluid are all typical symptoms of diuretic disease.[23]

- **Lac Resin (Shellac)**

Schleichera is a monotypic genus of plants in the Sapindaceae family. Schleichera oleosa, or Kusum, is a tree endemic to the Indian subcontinent and Southeast Asia. This plant has been used for a variety of purposes since ancient times. Its leaves, twigs, and seed cake are used as bovine fodder, and its wood is useful for fuel and charcoal production. Additionally, the seeds produce an oil called "kusum oil."

The pinkish-brown heartwood is exceptionally hard and robust, making it perfect for constructing pestles, cartwheels, axles, plows, tool handles, and rollers for sugar mills and oil presses. In India, the tree is also a host for the lac bug (Laccifer lacca).[24]

**Fig 8: Lac Resin.**

**Phytochemical constituents**

The leaves are high in gallotannic acid, crude proteins, calcium, and phosphorus. The bark contains tannins, pigments, and resins. The seeds, known for their high oil content (58-60%), create "macassar oil," which contains cyanogenic glucosides that are harmful to humans. As a result, the oil must be adequately filtered before usage. The seed oil contains 13-19% fatty acids, such as palmitic acid, myristic acid, eicosenoic acid, eicosadienoic acid, erucic acid, stearic acid, oleic acid, arachidic acid, gadoleic acid, behenic acid, and palmitoleic acid. Oleic acid content ranges from roughly 50% to 2.83-3%.[25]

**Pharmacological Activity**

Plants exhibit significant potential in various therapeutic roles, including antioxidant and anti-inflammatory activities. They also serve as promising antimicrobial agents and demonstrate effectiveness in anti-arthritic applications.[26]

- **Indian Frankincense (*Boswellia serrata*)**

Boswellia serrata Roxb., commonly known as Kundur, is a stem exudate derived from the oleogum resin of *Boswellia serrata*, a member of the Burseraceae family. The genus *Boswellia* comprises approximately 25 recognized species, predominantly found in Arabia, the northeastern coast of Africa, and India. *Boswellia glabra* Roxb. is considered a synonym for *Boswellia serrata*. When the tree is wounded, it secretes salai guggul, a type of oleo gum resin. It is the only non-coniferous source of turpentine and rosin in India. The resin, also termed olibanum, appears as semi-transparent pinkish tears, which are brittle when cold but turn greasy and malleable when heated.[27]

**Fig 9: *Boswellia serrata Resin.***

**Phytochemical constituents**: The alcoholic extract of Salai guggul (AESG) was shown to have anti-inflammatory and anti-arthritic properties. Boswellic acids inhibit leukotriene synthesis through a non-redox, non-competitive mechanism that targets the 5-lipoxygenase (5-LOX) enzyme. Salai guggul contains roughly 8-9% essential oil, 20-23% gum, and about 50% resin. The methanol extract of Boswellia serrata resin yielded a new lupane triterpene as well as boswellic acids. Purification of the fraction using a 1:1 combination of ethyl acetate and hexane led to extraction of 3αhydroxlup-20(29)-ene-24-oic acid.[28]

**3αhydroxlup-20(29)-ene-24-oic**

**Pharmacological Activity**

The essential oil of Indian frankincense exhibits a broad range of pharmacological activities, including anticancer, antimicrobial, psychotropic, antiulcer, and antioxidant properties. Its potential to modulate antibiotic resistance addresses one of the critical challenges in modern medicine—bacterial resistance to antibiotics. Additionally, it demonstrates antitumor, antimicrobial, antimalarial, antifungal, and neuroprotective effects.[29]

- **Canarium strictum (Black dammar):**

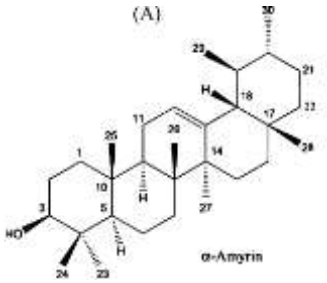
C. strictum produces a resin called 'black dammar,' locally referred to in India by the numerous names include mand dhuup, raal dhuup, karunkungiliyam, and sambrani.[30] The term "dammar" comes from Malay and refers to many types of resins. In taxonomy, various taxa have been named after dammar, including the coniferous

genus Dammara, which obviously refers to trees that produce resin. However, recent taxonomic revisions reallocated species from the genus Dammara to Protium Burm.f. (Burseraceae), Shorea Roxb. ex C.F.Gaertn. (Dipterocarpaceae), and Agathis Salisb. (Araucariaceae), including the resin-producing tree Agathis dammara (Lamb.) Rich. This has caused some misunderstanding with the vernacular name "dammar." The resin of C. strictum is dark brown, which is possibly why it is termed "black dammar."[31]

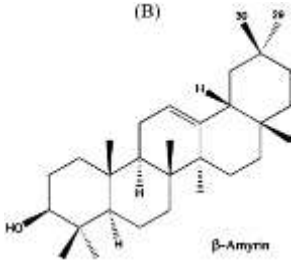
The resin of C. strictum does not spontaneously leak from the bark; instead, the tree must be incised to induce its production. This resin has long been used to treat rheumatism, asthma, sexual infections, and chronic skin ailments like as psoriasis and pityriasis. It is also used as a liniment for rheumatic conditions.

**Fig 10: Canarium strictum Resins.**

**Phytochemistry:** α-Amyrin and β-amyrin were isolated and identified from the crude extracts of *C. strictum* resin. These two compounds were responsible for the prominent signals observed in the spectrum of the DCM crude resin extract, as reported in studies on *C. strictum*. GC–MS analysis further confirmed that α- and β-amyrin are the primary constituents of the resin.[32]




**α-Amyrin**




**β-amyrin**

**Pharmacological Activity**

Crude drugs derived from *Canarium L.* exhibit a variety of medicinal qualities, including anti-inflammatory, antibacterial, antifungal, anticancer, hepatoprotective, antioxidant, and antidiabetic actions. Black dammar resin is derived from the damaged bark of Canarium strictum. This plant holds significant medicinal and economic value in various traditional medicine systems in India. Traditionally, the decoction or dried resin powder has been administered orally to treat conditions such as skin infections, hernias, syphilis, epilepsy, asthma, fever, and rheumatism. The resin can also be used to replace burgundy pitch in plaster production and to cure psoriasis and pityriasis on the skin. Furthermore, the resin is said to have analgesic and anti-inflammatory qualities.[33]

- **Convolvulus scammonia Resins**

Plants produce a large number of secondary metabolites, which are biosynthetically produced from primary metabolites and are an important source of pharmaceutical medications.[34] Field bindweed is a perennial vine that grows 0.4 to 2 inches tall and has deep, spreading roots. Its leaves, which are typically dull green with obvious veins, vary greatly in shape—usually arrowhead-shaped (hastate or sagittate), but often round, ovate, oblong, or linear, depending on environmental conditions. Stems are thin, hairless or slightly hairy vines measuring 1-6 feet long that form dense mats or climb objects. Flowers are funnel-shaped, 2-2.5 cm long, and have white or pale pink petals. The pistil is compound and has two stigmas. Fruits are spherical, light brown, and normally contain two seeds, however 1-4 seeds are common, with the occasional exception.[35,36]

**Fig 11: Convolvulus scammonia Resins.**

**Phytochemistry:** The root contains approximately 8% resin, dihydroxy cinnamic acid, beta-methyl-esculetin, ipuranol, sucrose, a reducing sugar, and starch. The resin is made up of glycosides and methyl pentosides produced from jalapinolic acid and its methyl ester. The primary active compound is the glucoside scammonin, also known as jalapin, with the chemical formula C34H114O6. The root of scammony is rich in bioactive components, with resin and glycosides, collectively referred to as Scammonin, being the key active substances in convolvulaceous plants. Acid hydrolysis of the ether-soluble resin extracts produces glucose and hydroxyfatty acid (C16H32O3). Meanwhile, the ether-insoluble resin extract yields there are seven organic

acids (acetic, propionic, isobutyric, isovaleric, 2-methylbutyric, n-valeric, and tiglic acids), as well as two hydroxyfatty acids (ipurolic acid and rhamnose). In contrast, jalapin, an ether-soluble resin, creates comparable organic acids, monosaccharides, and one hydroxyfatty acid called jalapinolic acid.[37]

**Pharmacological Activity:** Herbal medicine is the oldest form of treatment known to humanity. It served as the foundation for many ancient civilizations and remains the most commonly practiced form of medicine worldwide. Plants exhibit a broad spectrum of pharmacological activities, including antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous system, respiratory, immunological, anti-inflammatory, analgesic, antipyretic, and numerous other therapeutic effects.[32]

- **Gardenia Resinifera**

Dikamali, a plant endemic to peninsular India, develops small leaves and secretes a sticky material from the tips of its leaves and new shoots, known as dikamali or cumbi-gum. Traditionally, the resin is warmed in coconut oil and applied to the forehead and throat to relieve headaches. It also acts as an antihelmintic agent. When heated in oil, the vapors are inhaled to treat a runny nose. Additionally, the resin has antibacterial qualities.[38,39] The resin of the plant Gardenia resinifera is diluted in water and administered to patients to cure abdominal distension and piles. It is also given in tiny dosages to youngsters suffering from intestinal worms.[40]



**Fig 12: Gardenia resinifera Resin.**

**Phytochemistry**

Phytochemical compounds, including phenols, flavonoids, alkaloids, and other secondary metabolites, exhibit both nutritional and pharmacological properties. It also acts as an antihelmintic agent. When heated in oil, the vapors are inhaled to treat a runny nose. Additionally, the resin has antibacterial qualities.[38,39] The resin of the plant Gardenia resinifera is diluted in water and administered to patients to cure abdominal distension and piles. It is also given in tiny dosages to youngsters suffering from intestinal worms.[41]

**Pharmacological Activity**

Gardenia is widely used to treat a variety of illnesses, including bladder infections, abscesses, jaundice, and the presence of blood in urine, stool, or sputum. It also effectively manages anxiety, insomnia, and symptoms related with hormonal imbalances, such as depression, nervous tension, dizziness, and headaches.[42] This plant includes a variety of chemical substances, including methyl 7-keto-octadec-cis-11-enoic acid, dikamaliartanes A–F, Gardenin A, B, D, E, 5-Desmethylnobiletin, Xanthomicrol, and Acerosin.[43,44]

Gardenia resinifera has been reported to exhibit several notable pharmacological properties, including antispasmodic, expectorant, antimicrobial, and anthelmintic effects.[45,46,47] It also has anti-epileptic, antipyretic, and anticonvulsant properties, as well as antiproliferative effects on lung, breast, colon, hepatic, and leukemia cell lines.[48,49,50]

## CONCLUSION

This scoping review emphasizes the incredible diversity and medicinal value of various natural resins. Each type of resin, distinguished by its unique phytochemical composition—including terpenoids, flavonoids, and phenolic compounds—exhibits distinct pharmacological properties, such as antibacterial, anti-inflammatory, antioxidant, and anticancer activities. The review highlights their enduring significance in both traditional and modern medical practices, demonstrating their pivotal role in healthcare and industry. Moreover, advancements in extraction techniques and formulation technologies have further expanded their applications in pharmaceuticals, cosmetics, and other technical fields. However, challenges remain, including the need for a deeper understanding of the molecular mechanisms specific to certain resin types, the development of standardized extraction and quality control methods, and the implementation of sustainable harvesting practices to preserve ecological balance. Future research should focus on integrating traditional knowledge with scientific advancements, promoting interdisciplinary approaches to fully harness the potential of various natural resins. Such efforts will not only enhance their applications but also ensure sustainability and equitable access to these valuable resources.

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