



An Examination of Sandalwood Oil's Potential Miracle for Wrinkle, Skin Appearance, and Ageing Skin

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ABSTRACT

Known for its intriguing antioxidant properties, the Rasayana herbal remedies are a collection of Ayurvedic medicines from India that contain several medicinal herbs that have been utilised for thousands of years. Throughout history, sandalwood oil has been used in food, cosmetics, and medicinal items for a range of applications. Botanically, the sandal tree (*Santalum album* L, family Santalaceae) is also called Chandana in India. 5.2.5 to 4.5 percent is the typical oil yield. These days, its benefits on wrinkled skin are becoming more well-acknowledged. A quick analysis of several skin conditions, including wrinkles, ageing, and skin look, has been covered in this review article. Additionally, sandalwood oil's description and topical application usage have been covered. This means that it describes the cell-regulating qualities and Nitric Oxide (NO) scavenging actions on wrinkling skin, as well as the beneficial advantages of oil of sandalwood based on its antioxidant and non inflammation activity.

KEYWORDS: 'Sandalwood oil', 'antioxidant effects', 'anti-inflammatory properties', 'Nitric Oxide (NO) scavenging activities', 'Skin ageing' and 'wrinkle skin'

INTRODUCTION

membrane ageing is a ordinary individual "ageing mixture" that presents and follow varied trajectory in various organs, tissues, and cells throughout time. though the effects of time on in-house organs are concealed by the ambient "eyes," the skin is the primary to exhibit signs of ageing. [1]

Skin ageing is a complex biological process that is controlled by both internal (genetics, cellular metabolism, hormone and metabolic systems) and exterior factors (chronic light exposure, pollution, ionising radiation, chemicals, poisons).¹ In especially in areas of the skin that are exposed to the sun, these factors work together to create cumulative structural and physiological alterations, progressive changes in each skin layer, and changes in the look of the skin.^{2–12} Skin that has undergone premature photoaging has a thicker epidermis, mottled discolouration, deep wrinkles, laxity, dullness, and roughness in contrast to thin, atrophic, finely wrinkled, and dry skin that has undergone organic ageing.^{13–18} Skin elasticity gradually deteriorating with time is what causes sagging.[2]

Two distinct mechanisms affect the skin's ageing process. Skin ageing caused by external influences is known as extrinsic skin ageing, whereas the general ageing process, which is genetically set and occurs by passing time alone, is known as intrinsic skin ageing. Characteristic skin ageing indications result from each skin ageing phase. Functional changes rather than significant physical changes dominate the intrinsic skin ageing process. [3]

Sunlight-catalyzed photochemical processes combining volatile hydrocarbons that are halogenated chemicals, nitrogen oxides, etc. produce ozone (O₃) in the atmosphere[4].

One of the most priceless trees in the world is the *Santalum album* L., which is a member of the Santalaceae family. It is sometimes referred to as White sandalwood in English, Safed Chandan in Hindi, and Srigandha in Sanskrit. It is regarded as a valued gift from the plant kingdom that is woven into the history and culture of India. With more than 2,000 years of continuous history, sandalwood is regarded as one of the oldest known perfumery materials. From antiquity to the present, sandalwood has maintained its preeminence as a beloved perfumery ingredient. An examination of the past indicates that Indian mythology, folklore, and ancient texts all refer to sandalwood.[6]

Santalum album L. is native to Southern India's highlands and the Malay Archipelago is home to the plant *Santalum album* L. It often occurs in wide, arid areas at elevations between 2,000 and 3,000 feet. Additionally, it is planted (by seed), especially in the State of Mysore, which is the main location for generating the wood and essential oil. The tree is an obligate hemiparasite plant and may grow to a height of 60 to 65 feet. After the seed germinates, the roots quickly attach themselves to surrounding grasses, herbs, shrubs, and other undergrowth to obtain nourishment through the haustorium and eventually cause the host plant to die.[9]

Taxonomical rank	Taxon
Kingdom	Plantae
Sub-kingdom	Tracheophytes
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Santalales
Family	Santalaceae
Genus	Santalum
Species	<i>S. album</i>
Common name	Sandalwood, Chandan

The pleasant, distinctive scent of sandalwood is attributed to alpha and beta-santalols, two of the plant's active ingredients. In addition, the plant possesses a number of pharmacological and therapeutic qualities, including those related to hemolysis, antipyretic, cardioprotection, antibacterial, antifungal, anticancer, hepatoprotective, anti-ulcer, and antioxidants. Furthermore, the sandalwood plant is revered in many religions, including Buddhism and Hinduism, and is employed in a variety of religious rites. Nonetheless, the plant's wood is utilised to create a variety of items, including picture frames, cabinet panels, pen holders, bookmarks, jewel cases, wooden boxes, and bookmarks.[12]



Figure 1(11)

Skin

The outside covering of the body is the skin, which comprises approximately 8% of total body mass. It has ectodermal origins. It is the largest tissue system in the integumentary system and includes the skin as well as the interior and exterior linings of internal organs. The skin shields internal organs, bones, muscles, and other soft tissues from infections, toxins, and other dangerous environmental elements. It contributes significantly to the body's production of vitamin D, feeling, and temperature control. The skin serves as the body's initial line of defence against infections. The average adult human skin surface area is between 1.5 and 2.0 m². The skin can vary in thickness from 0.3 to several centimetres.[14]

It acts as the body's first barrier against germs, ultraviolet (UV) light, chemicals, and injury. [7]

It also renews cells in the skin. The dermis is the layer beneath the epidermis that contains blood vessels, nerve endings, hair follicles, and sweat glands. The dermis functions to provide elasticity, firmness, and strength to the skin.[7]

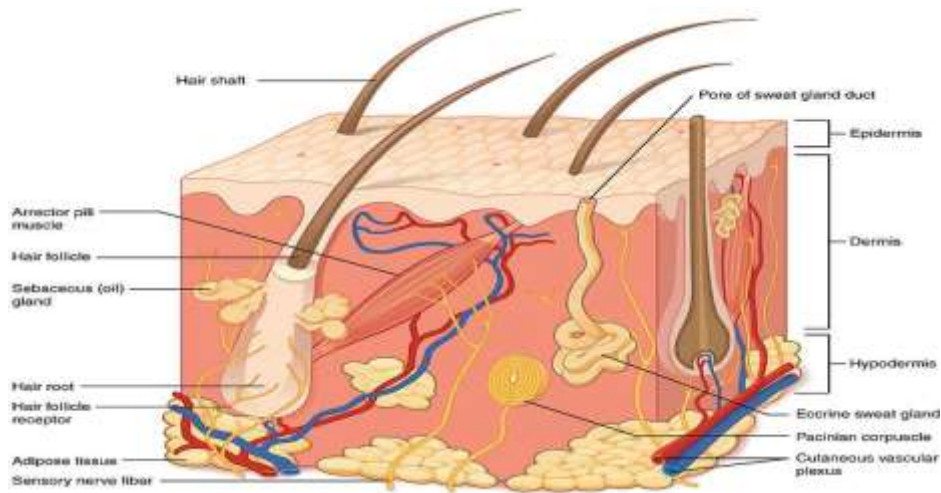


Figure 2(8)

❖ **Changes in skin appearance**

• **Dry skin**

The elderly usually have dry, scaly skin. This manifestation is partially caused by the deterioration or loss of skin barrier function with ageing. Aged skin has been shown to restore a broken barrier function more slowly, making it more prone to developing dryness. Lower lipid levels in lamellar bodies [79] and a reduction in epidermal filaggrin [80] are two factors in this multifactorial process. Aged skin also exhibits increased trans-epidermal water loss (TEWL), which makes the layer corneum more vulnerable to drying out in low-humidity situations. Aged skin also frequently exhibits roughness, wrinkles, skin pallor, hyper- or hypopigmentations, laxity, fragility, easy bruising, and benign neoplasms in addition to dryness.

• **Benign neoplasms in ageing skin**

Acrochordons (skin tags), cherry angiomas, seborrheic keratoses, lentigos (sun spots), and other lesions and cutaneous changes are only a few examples of how the look and surface texture of the skin can vary radically with age. The excision of these benign tumours is frequently requested by dermatology and plastic surgery patients. There are several damaging therapies. Procedures accessible, such as hyfrecation and other laser alternatives. e in the synthesis of vitamin

Skin ageing

Rich countries' life expectancies are rising gradually, yet the mystery of ageing is still largely unresolved. The incidence of physical and mental disability, as well as disorders related to ageing, has increased. Life expectancy has significantly increased, especially during the 20th century, because of medical advancements. One-third of women may experience menopause over the next 50 years, increasing the need for anti-ageing medications. The social effects of skin ageing are very important. It is readily accessible and makes a fantastic model organ for research on the ageing process.

Similar permanent deteriorating effects on the outermost layer of skin and internal tissues are caused by the "biological clock". The top five non-surgical cosmetic treatments include chemical peeling, a procedure called micro fill the procedure, laser hair elimination, and botulinum toxin injection; significant surgical operations include slimming down, enlargement of the breasts, plastic surgery of the eyelids, nose restructuring, and breast decrease.

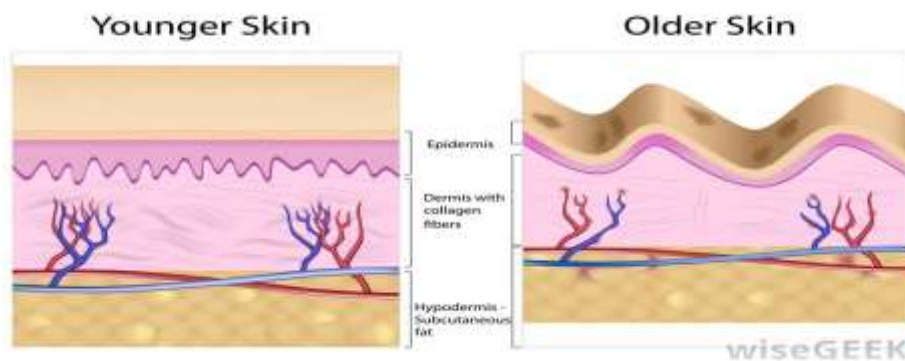


Figure 3(34)

Extrinsic and intrinsic ageing are factors that impact the ageing process.[10]

Wrinkles

It was concluded that the wrinkle is a configurational change, like the grooves worn into an old glove, without specific structural alterations at the histological level. The skin becomes looser, excessive, and loses the ability to snap back to its original state after being deformed.(23)

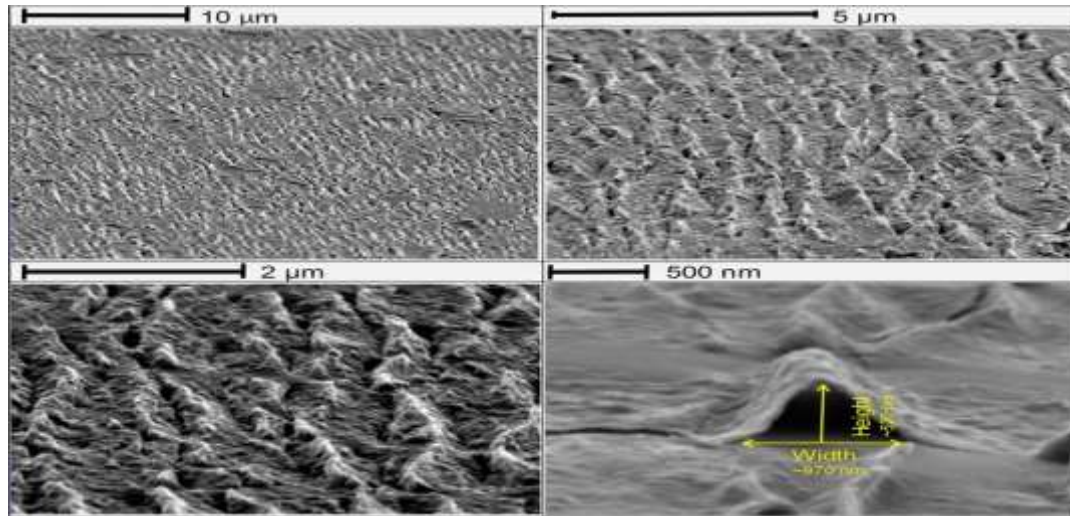


Figure 4(24)

Wrinkles classification

The wrinkles are distinguished in

- **Texture**

The wrinkles may be identified by their texture. The surface pattern of even newborn skin is composed of grooves or depressions that join to form a small rhomboid area.

- **Phraseological**

These are the wrinkles that appear on the face as a result of the skin adjusting to the movements of the facial muscles. In actuality, the insertion sites of the facial muscles are located beneath the skin. Thus, the skin moves in tandem with them. These cranes become evident about thirty years of life, but instead of multiplying, they deepen with time. Their movement is counter to that of the muscle fibres.

- **Intersecting lines**

The normal movements of the skin depend on them, and they are located in the schematic articulations.

- **Grooves from muscular skin laxity**

Due to the collagen's lack of elasticity, they often manifest as a result of ageing. As a result, the dermis is no longer able to resist gravity, and muscle tissue is decreased. This type of groove naturally develops on the face as a result of the skin's natural fall. In this scenario, there is only surgical therapy.

- **Lines from sleeping**

These folds are the result of the sleeper's lateral posture. On the photo's scarred skin, they subsequently appear.

Plant description

The plant was largely used to produce aromatic sandalwood oil by steam distillation. a tiny, glabrous, evergreen tree with drooping, white sapwood. Strongly fragrant golden brown heartwood. The reddish-purple indecorous flowers are in terminal and auxiliary panicle cymes that are shorter than the leaves. The leaves are elliptic lanceolate, subacute, glabrous, and whole. Four valvate triangular segments make up the campanulated limb of the perianth, which is alternated with four exerted rounded-obtuse scales. 1.3 cm in diameter. Drupe globose. Purple-black; endocarp hardribbed fruit concealed about the size of a pea, spherical, capped with rim resembling vestiges of perianth tube, smooth, somewhat flesh, nearly black, seed single

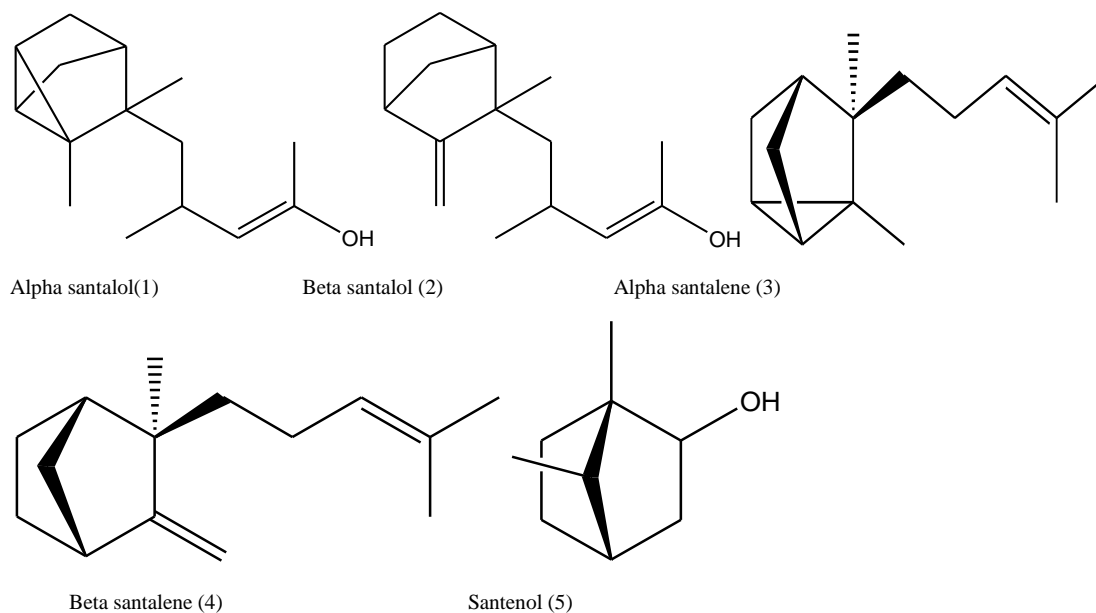
Traditional uses

Sandalwood is mostly used as a cooling, but it also has calming and astringent properties that make it beneficial as a bronchial and genitourinary tract disinfectant, as well as a diuretic, expectorant, and stimulant. The tasty Sandalwood oil is helpful in perfume because of its powerful and enduring scent

industry. The same is employed as a blood cleanser, memory enhancer, anti-poison, and tonic for the heart, liver, stomach, and fever. Various Sandalwood's applications in the Ayurvedic system are listed in therapy of other conditions, such as diarrhoea with internal bleeding first phase: bleeding piles, vomiting, poisoning, and hiccoughs including shingles, urticaria, eye infections, and umbilical cord irritation.(33)

PHYTOCHEMICAL INVESTIGATION

The primary sesquiterpene alcohol in the oil, santalol, is a mixture of two primary sesquiterpene alcohols, C₁₅H₂₄O, with the α -form predominating. It is extracted from the roots and heartwood of *Santalum album* L and is a colourless to yellowish, viscous liquid with a peculiar heavy sweet odour. Above hundred constituents of sandalwood oil in categories of tannins, terpenes, resins and waxes have been reported, they have such as hydrocarbons-santene(C₉H₁₄), nor tricyclo-ekasantalene (C₁₁H₁₈), α - and β - santalenes (C₁₅H₂₄), alcohols-santenol (C₉H₁₆O), teresantalol (C₁₀H₁₆O), aldehydes-nor-tricyclo-kasantalal (C₁₁H₁₆O) 3,7,8 and the acids α -and β - santalic acids (C₁₅H₂₂O₂) and teresantalic acids (C₁₀H₁₄O₂). (15)



Cyclosantalal (0.21–2.26%) and isocyclo-santalal(0.11–1.47%) novel sesquiterpene aldehydes were reported as two minor components. Additionally, an intriguing natural sulfoxide diastereoisomer, gamma-L glutamyl-S-(trans-1-propenyl)-L-cysteine sulfoxide, and a novel acid, ketosantalic (as methyl ester), have been discovered from sandal. Additionally, some writers claim that *Santalum album* contains Tricyclosantalal, -santalene, trans-bergamotene, -santalene (S & E), -curcumine, -santalol, beta-santalol(S & E),nuciferol, -santalal, and -santalal.(16,17)HESP (Hydrolysed Exhausted Sandalwood Powder), a novel essential oil with anti-inflammatory, antipyretic, mildly sedative ganglionic properties, is produced by hydrolyzing non-steam volatile components of exhausted sandalwood powder with methanolic hydrochloric acid. blocking, hypertensive, or blood pressure-lowering medication a pesticide and insecticide in managing forest pests. By increasing the liver's acid-soluble SH level and glutathione-S-transferase (GST) activity, sandalwood oil exhibits indirect antioxidant action. (18)There have been claims that it contains DPPH antioxidant and nitrous oxide scavenging properties. (19) Cyanidin-3 glucoside, an anthocyanin pigment from *S. album*, is an important vitamin and antioxidant.

(20)For ease of comparison, only the outcomes for the reference chemical with the highest antioxidant potentials are in Table 3. (21) With doses of sandalwood oil (via gavage) of 5 and 15 ml for 10 days, respectively, there is a 1.59 fold and 1.57 fold rise in GST and SH-levels in hepatic tissue. (21)

PHARMACOLOGICAL ACTION:

Antioxidant

Sandalwood oil is said to have an indirect antioxidant effect by raising the liver's acid-soluble SH content and glutathione-S-transferase (GST) activity. GST activation increased 1.80 and 1.93 times, respectively, when 5 ml of sandalwood oil was fed (by gavage) to Swiss albino mice for 10 and 20 days. The enzyme's activity increases by 4.73 and 6.10 times after a dosage of 15 millilitres of sandalwood oil given for 10 and 20 days, respectively. Additionally, at dosages of 5 and 15 ml of oil (via gavage) for 10 days, respectively, there is a 1.59 and 1.57-fold rise in SH levels in hepatic tissue (18).

Cell regulatory property

Sandalwood oil is used topically to treat dry skin disorders resulting from dehydration and inflammation. It has calming, cooling, and moisturising properties. It may be used to treat acne, greasy skin, and psoriasis as well as ease eczema. Sandalwood is helpful for skin care because of its emollient qualities. Sandalwood oil helps cure oily skin and acne and is calming, cooling, and moisturising for dry skin issues brought on by dryness.(26–28)

Metabolic property

Changes in the newborn hepatic xenobiotic metabolising enzymes in nursing mouse pups exposed to sandalwood oil trans-mammary have been reported. Further research reveals that the components of sandalwood oil and milk changed the hepatic xenobiotic metabolising enzymes, increasing hepatic www.wjpmr.com expression. The hepatic cytochrome P 450 content was lowered while the contents of hepatic cytochrome B5, acid-soluble sulphhydryl, and glutathione-S-transferase, glutathione reductase, and glutathione peroxidase increased concurrently, according to the World Journal of Pharmaceutical and Medical Research.

Anti-inflammatory property

East Indian sandalwood is an emollient that helps remove heat and agitation from the skin and promotes the growth of healthy skin cells. It is an anti-inflammatory for dry skin disorders like eczema. Sandalwood oil is an excellent anti-ageing skincare ingredient because it reduces skin irritation and inflammation. It works particularly well on dehydrated skin. Additionally, its astringent action tones the skin and is effective against oily skin conditions, dry eczema, and the formation of unsightly scars.[30]

Significant suppression of carrageenan-induced paw oedema, cotton pellet-induced granuloma, and pylorus ligation-induced ulcers demonstrated the anti-inflammatory and antiulcer properties of Santalum album. These results may support the use of this plant in the conventional medical system's successful treatment of inflammatory conditions like ulcers. Sandalwood methanolic extracts were shown to have in vivo analgesic and anti-inflammatory properties in mice, as well as in vitro antioxidant activity.[31]

The Evaluation of Nitric Oxide Scavenging Activity

Using sodium nitroprusside as a NO donor in vitro, extracts from Indian herbal vegetation, including S. album, were explored regarding prospective on nitrate oxides (NO) quantities. The majority of plant extracts showed notable efficacy and direct, dose-dependent scavenging of NO.[32]

Conclusion

Sandalwood oil topical treatments may differ in their effects on the skin based on the constituent parts. The elements of sandalwood oil might potentially replenish and revitalise skin that has wrinkles by several pathways including (i) antioxidant activities; (ii) antioxidant ability to cause inflammation; (iii) Nitric Oxide (NO) (iv) cell regulatory characteristics, scavenging activities, and characteristics of metabolism (v). One can add further research to make it possible to comprehend sandalwood oil better. the possibility to create medicine for dermatology and use this oil in skin care products.

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