



“A REVIEW PAPER ON HERBAL NAIL PAINT”

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ABSTRACT

China is where nail polish first appeared around 300 BC. In the past, people used nail polish. The use of nail polish dates back more than a millennium. Nail polish is applied for aesthetic enhancement, self-expression, and personal grooming. On human fingernails, a lacquer known as nail polish can be used to embellish and protect the nail plates. Several changes have been made to the nail polish to enhance its decorative appearance. The herbal nail paint can guard against chemical damage to the nails. The nail paint formulation is created by simply blending natural color pigments; it is then tested for drying time, appearance, smoothness, hardness, color, stability, and credibility.

Natural color pigment, herbal ingredients, and nail paint formulation were combined to create an herbal nail paint that may shield nails from the dangerous chemicals included in synthetic nail polish. The natural color pigments were carefully selected to produce vibrant and durable colors. The herbal ingredients have their possible advantages in improving nail health and minimizing side effects. I.P. stated that the evaluation tests were within normal bounds. A wide variety of colors are available for nail paint tones. They come in a variety of hues. The subject matter included nail anatomy, qualities, composition, benefits, natural colorants for herbal nail paints, evaluation, and flaws of nail polish. Herbal nail paint has the potential to revolutionize the health and cosmetics sectors.

KEYWORDS

Nail polish, Nail lacquer, Nail enamel, colorants, binders, Thickeners, preservatives, Herbal extract.

INTRODUCTION

The structure of the nail is a protective structure used for centuries as a survival tool and, over the years used as an accessory for beautification. The nail is the most visible skin appendage. It continues to grow throughout one's life. The size & shape of the nails differ from finger to finger & toe to toe. The nail apparatus consists of both epithelial & connective tissue components. The matrix epithelium is responsible for creating the nail plate ^[1]. Nails serve as both ornamental & protective structures, but they are also thought to be an alternate route for medicine administration, particularly in conditions & onychomycosis ^[2]. This nail disorder is very common throughout the entire population ^[3]. Natural henna was applied as a nail colorant. Royalty was assigned specific colors, such as red, gold, & silver, while the general public was required to wear softer hues ^[4]. The purpose of nail paints which are semi-liquid or viscous substances, is to decorate the fingernail or toe nail. There are a variety of nail paints ^[5]. Nail lacquers & moisturizers help keep nails hydrated ^[6]. Nail plate due to its horny composition structure. Topical drugs only permeate a part of the surface due to its hardness. As a result, the therapeutic concentration is not optimal. A decrease in luminescence might cause an irregular nail plate appearance. This can be caused by nail bed involvement, reduced blood supply, or physical/chemical characteristics of the nail bed. As a result, a range of disorders develop. These disorders can be cured by achieving therapeutic medication concentrations with nail drug delivery systems ^[7].

Nail polish

Nail polish is lacquer used to adorn and protect fingernails and toenails. Nail polish is made up of an organic polymer and other components that add color and texture. Nail polish is a highly sought-after cosmetic product. Nail polish is popular as a simple technique to enhance the appearance of hands ^[8]. It can enhance your beauty & confidence. It can also help to decorate unattractive fingernails & toenails.

What is herbal nail polish?

Natural nail polish is an enamel that doesn't contain several of the typical chemicals present in conventional nail polish. Natural nail polish is devoid of typical components found in ordinary nail polish, such as formaldehyde, toluene, artificial colors, xylene & phthalates. The primary active ingredient in nail polish is derived from plants, from plants, fruits, and leaves which makes it safer than synthetic ones.

Advantages of herbal nail polish

- Stronger, long-lasting, thicker nails.
- No brittle nails.
- Nails that resist chips.
- Nourished & moisturized nails ^[9].
- Nails that resist the breaking.
- Waterproof & resistant to scratches

Disadvantage of herbal nail polish

- It makes natural nails and weaker & thinner.
- Chemicals can irritate the skin around the nails & can be absorbed into the bloodstream.
- Artificial coloring which has a neurotoxic & cancer-causing impact.
- The skin quickly dries out & becomes dehydrated.

- Frequently produces an allergic response.
- Toluene, formaldehyde, & dibutyl phthalate are harmful to the environment ^[10].
- Toxic impact on the body.
- Toluene irritates the skin & produces weariness, forgetfulness, & memory loss.
- Formaldehyde is a known carcinogen.
- Camphor causes the yellowing of nails by depleting their nutrition.

Function of nails

- ❖ Protect the soft tissues in your fingers and toes from harm.
- ❖ Enhance sensation.
- ❖ Used to cut & scrape.
- ❖ Used to support your fingers & toes.
- ❖ Fingertips move precisely.

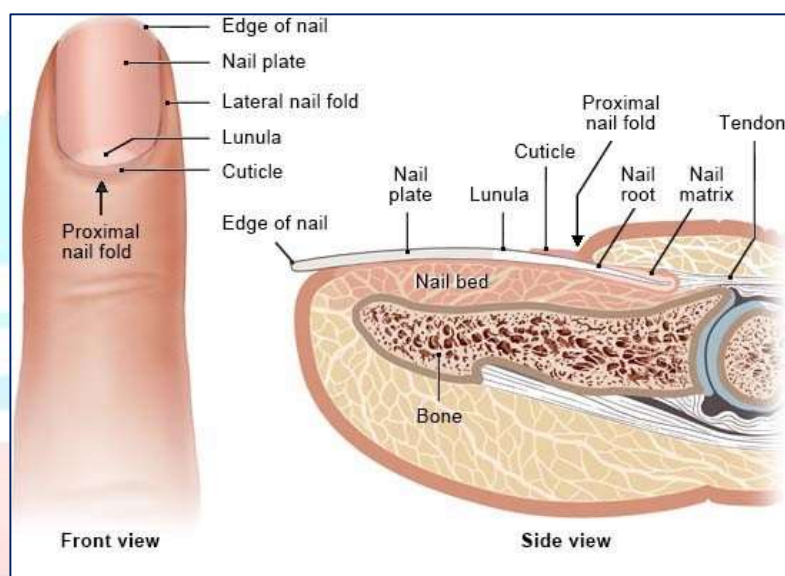


Fig.1:- Structure of nail

STRUCTURE OF NAIL

The human nail consists of the following parts-

- 1) Nail matrix
- 2) Nail plate
- 3) Nail bed
- 4) Hyponychium
- 5)Eponychium or cuticle
- 6)Paronychium
- 7)Lunula

1. **Nail matrix**- The finger & toenails begin to grow called a nail matrix. The matrix generates new skin cells & removes dead ones to form your nails. The injuries to the nail bed or conditions that affect the matrix might impact nail growth. The root of the fingernails is sometimes called the germinal matrix. The germinal matrix edge is characterized by a white, (crescent-shaped& half-moon) structure known as the LUNULA. The nail behind the fingernails extends several millimeters into the finger.

2. **Nail plate**- The "nail plate" is the technical term for the portion often as the nail. Nail plates are mostly composed of keratin, a hard substance. It is gently curved & measures around half a millimeter thick. The nail is linked to the nail bed. The nail bed consists of two layers of skin dermis & epidermis.

3. **Nail bed**- The nail bed is part of the nail matrix, also known as the sterile matrix. It is a pinkish soft tissue beneath the nail plate. It connects the germinal matrix(lunula) to the hyponychium. This thin, soft, non-cornified epithelium connects to the ventral layer of the nail plate & the underlying papillary dermis & blood vessels, nerves & melanocytes.

4. **Hyponychium**- Hyponychium is the skin beneath the free edge of your nails. The hyponychium is found near the fingertips and beyond the distal end of the nail bed, but it might grow larger over time. The hyponychium acts as a barrier, preventing pathogens and debris from entering the nail bed.

5. **Eponychium**-The eponychium is a thicker layer of skin near the nose of nails and toenails. It is also known as the medial or proximal nail fold. The eponychium varies from the cuticle in that it contains skin cells, while the cuticle contains dead skin cells.

6. **paronychium**-The perionychium is the skin that covers the nail plate on both sides. It's also known as the paronychial edge. The perionychium is responsible for hangnails, ingrown nails, and skin infections such as paronychia. Paronychia is an infection of the tissue surrounding a nail, typically a fingernail.

7. **Lunula**- The lunula is the visible part of the distal nail matrix that goes beyond the proximal nail fold. It is a whitish, half-moon-shaped (curve-like) structure that forms during week 14 of gestation and has distinct histological characteristics. The lunula primarily defines the free borders of the distal nail plate^[11,12].

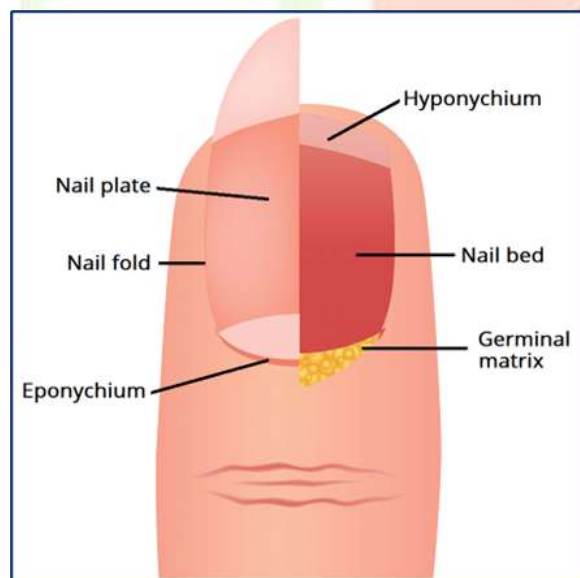


Fig.2: - Anatomy of nail

ANATOMY OF THE HUMAN NAIL

The chemical composition of human nails differs significantly from other bodily membranes. The plate is formed of keratin molecules with high disulfide connections and low lipid levels, making it more like a hydrogel than a lipophilic membrane.

The macroscopic anatomy of the human fingernails includes three distinct components.

1. **Nail plate**-The nail plate is a thin (0.25-0.6 mm for fingernails and up to 1.3 mm for toenails), stiff, slightly elastic, semi-transparent, convex structure composed of approximately 25 layers of dead flattened keratin cells. They are tightly connected with several intercellular linkages. Nail plates are rectangular and have a smooth, smooth, shiny surface. Attaching it to the nail bed causes it to turn pink, allowing visualization of blood vessels. The free edge is white. The lunula affects the distal border of the nail plate. The nail plate's physical properties are distinctive and necessary for its applications. It is hard and flexible, resistant to chemicals, and adhesive to the underlying tissues.

2. **Nail** The nail bed dermis is located on the distal phalangeal bone and is separated from the periosteum by connective tissue. Fat is typically lacking in the subcutaneous layer. The nail bed dermis is distinctive in structure. The skin lacks papillae and instead features longitudinally running dermal crests with parallel blood vessels. The nail bed is part of the nail matrix, also known as the sterile matrix. The soft tissue beneath your nail plate (the hard section of the nail) appears pinkish. It spreads from the germinal matrix(lunula)to the hyponychium. The epithelium is thin, soft, and non-cornified. It connects to the ventral layer of the nail plate and the underlying papillary dermis and houses blood vessels, neurons, and melanocytes.

3. **Nail matrix**- It helps with the formation of nail plates. The nail matrix is your finger and toenails begin to grow. The matrix produces new skin cells and removes dead ones to form nails. The damage to the nail bed or matrix abnormalities might hinder nail growth. The root of the fingernails is also referred to as germinal matrix. The germinal matrix's edge is represented by the LUNULA, a white crescent-shaped structure that resembles a half-moon. Throughout life, the matrix continuously creates the nail plate. In frontal view, the matrix has a horseshoe form with a distal convexity and two lateral horns. In the transverse perspective, the matrix is V-shaped.

The fingernail has a three-layer structure-

1. **Dorsal layer(superficial)**-It originates from the matrix.
2. **Intermediate layer(middle)**-It also originates from the matrix.
3. **Ventrallayer(deep)**-It originates from the nail bed. The thickness ratio is approximately 3:5:2, respectively.

The ideal nail polish application techniques involve the following steps.

1. **Base Coat**- The initial layer is to build up the nail plate. This clear, high-resin solution promotes stronger nail polish attachment. It restores moisture to nails, fills ridges, and creates a smoother surface.

2. **Nail Polish**- Apply 2-3 coats of nail paint to achieve desired colour.

3. **Top Coat**-Apply a translucent clear coat with more nitrocellulose than the fourth resin. This keeps the nail polish from cracking and falling. It enhances the polish's shine. This transparent nail polish is used after applying the nail polish. The top coat speeds up the drying time of the underlying-colored polish.

4. **Nail polish drier**-The liquid solvent evaporates, causing the nail polish to dry faster. In general, it includes vegetable oils, alcohol, and silicone derivatives. [13,14]

Constituents of nail polish –

1) Film-forming agent: - Nail polish is applied; the solvents evaporate and the polymer forms a coating on the nail.

Example-Nitrocellulose is dissolved in a solvent, usually ethyl acetate or butyl acetate.

2) Plasticizer- polish remains flexible after drying, resulting in a longer-lasting finish.

Example-Dibutyl palmitate and camphor, trimethyl pentanedi isobutyrate, triphenyl phosphate, ethyl tosylamide, glyceryl tri benzoate.

3)Adhesive polymer resins-Adhesive polymer resins ensure nitrocellulose adheres to the nail plate's surface.

Example-1) Tosylamide-Formaldehyde resin 2) Hypoallergenic nail polishes typically contain polyester resins or cellulose acetate butyrate.

4)Dyes and pigments-Colour is imparted by dyes and pigments.

Example-Chromium oxide greens, chromium hydroxide, ferric ferricyanide, stannic oxide, carmine, ultramarine, and manganese violet.

5)Opalescent Pigments- Opalescent pigments create a glittering or shimmery effect.

Examples: metallic bismuth ox chloride, natural pearls, and aluminum powder.

6)Thickening agent-The thickening ingredient kept the sparkling particles suspended in the bottle.

Example-Stearalkoniumhectorite.

7)Ultraviolet Stabilizers-Ultraviolet stabilizer prevents color changes when dried film is exposed to sunlight.

Example-Benzophenone-1 ^[15,16].

Disorders of the nail-

1. Leukemia
2. Nail infection
3. Clubbing
4. Paronychia.
5. Onychomycosis
6. Disorders caused by nutritional deficiencies ^[17].

THE HERBAL PLANTS USED FOR THE PREPARATION OF NAIL PAINT

1. HIBISCUS

History

For thousands of years, medicinal compounds have been extracted from nature and used in traditional medicine. *Hibiscus rosa sinensis* is a popular evergreen herbaceous plant in the Malvaceae family. This species is native to tropical and subtropical climates. This plant is often grown as an ornamental plant. The blossoms are often dark red in hue. Cross-breeding has led to the development of several new kinds. Numerous cultivars and hybrids exist with diverse flower colors and characteristics. There are 300 species of plant. Hibiscus flower has been utilized for its analgesic, memory-enhancing, diabetic, anti-inflammatory, antioxidant, anti-microbial, anti-diabetes, anti-tumor, anti-modulatory, hepatoprotective, dermatological, urinary, and fibrinolytic properties, among other benefits. They have contributed significantly to improving pharmacological and therapeutic outcomes for numerous diseases [18,19,20].

PLANT PROFILE

- SCIENTIFIC NAME: - *Hibiscus rosa sinensis*
- COMMON NAME: - *Hibiscus rosa sinensis*
- KINGDOM: - Plantae
- SUB KINGDOM: - Tracheophyte
- DIVISION: - Angiospermae
- CLASS: - Magnoliopsida
- ORDER: - Malvales
- FAMILY: - Malvaceae
- GENUS: - *Hibiscus*
- SPECIES: - *Rosa-sinensis*

Biological source-

Hibiscus is in the Malvaceae family. It grows on its own in tropic and sub-tropic regions of the world and is native to tropical Asia, and south-eastern Asia (China). It is grown as an ornamental plant in gardens throughout India. The hibiscus can show the pharmacological and pharmaceutical importance of *hibiscus rosa sinensis*. It shows various pharmacological activities.

Geographical source-

The Hibiscus genus has around 200 species can be found in tropical and subtropical climates. Hibiscus can commonly grow in gardens, they are found from sea level to 500 meters above the sea level. This plant is frost sensitive and may freeze in mild winters, but will re-grow from the base of spring. This plant thrives in full light, well-drained, and organically rich soil. *Hibiscus rosa sinensis* plant is native to China. Also found in Bangladesh, India, Pakistan, Myanmar, Bhutan, Maldives, Indonesia, Australia, and almost all over the world.

DIAGRAM



Fig .3 – Hibiscus

CHEMICAL CONSTITUENTS-

The edible flower contains many elements such as nitrogen, lipids, crude fibers, calcium, phosphorus, iron, thiamine, ascorbic acid, and niacin. Hibiscus rosa-sinensis petals have been shown to contain quercetin-3-di-O- β -D-glucoside, quercetin-3-7-di-O- β -D-glucoside, and kaempferol. The primary anthocyanin found in the red flower of H. Rosa sinensis contains cyanidin-3-sophoroside. H cultivars with red petals. Rosa-sinensis had more anthocyanin bands than yellow-yellow-orange cultivars. The quantitative distribution of anthocyanins, leucoanthocyanins, flavonoids, and carotenoids varied throughout the colored groups. The flower contains 7 mg of quercetin and 36 mg of cyanidin as flavonoid aglycones per gram of fresh tissue. The following flavones were also said to be present in the flowers: quercetin-3-diglucoside, quercetin-3,7-diglucoside, cyanidin-3,5-diglucoside, and cyanidin-3-sophoroside-3-5 glucoside form deep yellow and white flowers, as well as ivory white blooms, is kaempferol-3-xylosylglucoside. The leaves and stem include β -sitosterol, stigma sterol, taraxeryl acetate, and three cyclopropane chemicals or derivatives. Fatty acids, fatty alcohols, and hydrocarbons were found in hibiscus rosa sinensis leaves. Quercetin, β -sitosterol, and linoleic acid can be used as bioactive markers to quantify hibiscus rosa sinensis flowers [21,22,23].

PHARMACOLOGICAL ACTIVITY-

1. Antimicrobial activity

Hibiscus rosa-sinensis extracts showed antibacterial efficacy against both gram-positive and gram-negative bacteria and fungus strains, as measured by zone of inhibition. The leaf extracted showed excellent activity against staphylococcus aureus at a low concentration (2.5 μ g/ml) compared to E.coli and Bacillus subtilis. The leaf extracted showed excellent efficacy against candida parapsilosis at a low dose (2.5 μ g/ml) compared to Aspergillus niger. Hibiscus rosa-sinensis root extract has shown high efficacy against all tested microorganisms at a low dose (2.5 μ g/ml) [24].

2. Anti-inflammatory

An ethanol extract of dried leaves administered intraperitoneally to rats at a dose of 100.0mg/kg effectively treated carrageenin-include pedal edema. Vivek Tomer et al discuss the anti-inflammatory properties of hibiscus rosa sinensis. Hibiscus rosa sinensis is effective in treating several inflammatory disorders, including amenorrhea, bronchitis, and oral mucosa [25].

3. Antipyretic activity

Antipyretic efficacy shows 24 Savarkar. The effect of hibiscus rosa sinensis as an antipyretic in rats was investigated by A.R. et al. The antipyretic effect of hibiscus rosa sinensis leaves was tested on v-Wistar rats.

Hibiscus rosa sinensis extracts, both aqueous and alcoholic, were compared to a control group to minimize high temperature [26].

4. Anti-cancer activity

Cell lines for oral cancer KB were treated with 75µg for 125 hours. The DNA fragmentation assay and agarose gel electrophoresis revealed that both concentrations of treated cells had fragmented DNA compared to the control sample. This indicates that hibiscus extract inhibited the proliferation and pilipheration of oral cancer cells [27].

5. Antifungal activity

According to provisional research has demonstrated that methanol extract from hibiscus rosa sinensis leaves exhibit antibacterial properties against Candida albicans, Aspergillus niger, Candida parapsilosis, and trichophyton rubrum. After 24 hours of incubation at 37°C using the good diffusion method, the greatest zone of inhibition against Aspergillus niger was 9.3±0.57 mm, followed by 6.6± 0.57 mm against candida albicans at an 80 µg/ml concentration of leaves methanolic extract. The study revealed flavonoids, tannins, terpenoids, saponins, and alkaloids as potential chemical components responsible for antifungal action in fungus taken from infected skin [28].

6. Antitussive effect

Using a cough model generated by citric acid (7.5⁰/₀w/v), the antitussive efficacy of methanolic extract of hibiscus rosa sinensis was assessed in a histamine chamber. Codeine and hibiscus rosa sinensis methanolic extract dramatically reduced the amount of coughing [29].

7. Anti-haemolytic Activity

Hibiscus rosa-sinensis flowers were studied in vitro for their anti-hemolytic action. The flower extract at different concentrations was tested on erythrocytes for hydrogen peroxide-induced hemolysis and lipid peroxidation, which indicate erythrocyte damage. In vitro, the extract effectively decreased hydrogen peroxide-induced hemolysis and lipid peroxidation [30].

PREPARATION OF NAIL PAINT

Chemical used

Table 1: List of chemicals used and their property [31]

Sr. No	Name of ingredients	Property
1.	Hibiscus	Colouring agent
2.	Castor oil	Plasticizer
3.	Ethanol	Solvent
4.	Formaldehyde	Resins
5.	Ethyl cellulose	Film-forming agent

Instruments used

Sr. No	Instrument
1.	pH meter
2.	Petri dish
3.	Magnetic stirrer
4.	Glass rod
5.	Beaker
6.	Glass slide
7.	Funnel

Table 2: Formulation of nail polish

Sr. No	Ingredients	Quantity of 10 ml
1.	Hibiscus	1 gm
2.	Castor oil	1ml
3.	Ethanol	10ml
4.	Formaldehyde	0.90ml
5.	Ethylcellulose	5gm

PROCEDURE

1. Transfer the film-forming agent to a mortar after accurately weighing it and triturate it.
2. The solvent mixture contains dissolved ethyl cellulose and resin.
3. Disperse the color of castor oil.
4. Stir the dispersion into the ethyl cellulose solution uniformly.
5. Transfer all the content to the appropriate container, label it, and submit.

CONCLUSION

Natural nail paint offers a promising alternative to conventional nail polishes, combining beauty with health benefits. This formulation is typically made from natural, non-toxic ingredients that reduce the risk of skin irritation and allergic reaction making them suitable for individuals with sensitive skin or those seeking eco-friendly beauty products additionally herbal nail paint often excludes harmful chemicals like formaldehyde which is commonly found in traditional nail polishes. Overall herbal nail polish represents a positive shift towards healthier, environmentally conscious beauty, ideal for those prioritizing natural ingredients in their personal care routine, further research and product innovation could improve their performance making them more comparable to conventional alternatives.

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