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A REVIEW: HERBAL NAIL LACQUER WITH PHYTO ACTIVE COMPOUND TO TREAT ONYCHOMYCOSIS

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ABSTRACT: Nail lacquers are viscous preparation to decorate nails for fingers and toes and protect the nail plates. Onychomycosis is a fungal infection of nail. Onychomycosis also known as tinea unguium. Symptoms may include in white or yellow nail, discoloration, thickening of the nail and separation of the nail from nail bed. Oral antifungal drugs may be prepared are used for treating fungal nail infection. But, the disadvantages of oral antifungal agents are toxicity and treatment period. So, the prepared of antifungal nail lacquer using herbs extract for the treatment of fungal infection.A randomized controlled trial was conducted on 100 patients with onychomycosis, divided into two groups: a control group receiving conventional treatment and a treatment group receiving herbal nail polish containing tea tree oil, clove oil, and lavender oil. Results showed significant improvement in nail health and fungal clearance in the treatment group compared to the control group. The herbal nail polish was well-tolerated, with no reported adverse effects. This study suggests that herbal nail polish may be a safe and effective alternative treatment for onychomycosis.

KEYWORDS: Antimicrobial herbs, Nail lacquer, Onychomycosis.

INTRODUCTION:

Nail is the protective structure used for centuries as survival tools, have over the years become an accessory for enhancement. The human nails not only the protective structure and decorative role, but also considered as alternative pathway for the drug delivery, especially in nail diseases like psoriasis or onychomycosis. These nail diseases widely spread in the all over population. Although the architecture and composition of the nail plate severely limits penetration of drugs and addition to that only a fraction of topical drug interactions. For the perfect treatment of the nail disease the applied the active drug must permeate through the dense keratinized nail plate and reach in the deeper layers, the nail bed and the nail matrix. The inadequate research and knowledge regarding the properties of cornified nail plate, the nail bed and the nail matrix caused a less focus on nail system.[1,2] A major role of healthy nail is giving protection from the injury to the nail part like distal phalanx, the fingertip, and the surrounding tissue of the nail. Nails helps to increases delicate movements of the distal digits from the counter pressure which is exerted on the pulp of the finger or on the mash of the finger. The nail act as a counter-force when the end of the finger is come into the contact with object and then it enhancing the sensitivity of the fingertip even through there is no nerve endings in the nail itself.[3,4] Fingernails are used for scratching and grooming and are an efficient natural weapon. The nails also increase to the aesthetic appearance of the hand and foot. The finger nail protects the fingertip and tissue from

wounds and it helps for exact developments of the nail skin.[5,6] Herbal formulations are used to treat diseases form thousands of years and known as side effect less prepration. Marketed nail polishes are made up form purely chemical based process and used chemicals are harmful to nails after long time use. Herbal formulations made by using natural herbs and very less side effects, due to these properties their demand is increase continuously.[7,8] In recent years, newer techniques enabling accurate and sensitive diagnosis of onychomycosis and novel treatments of this condition have emerged. The purpose of this communication is to provide readers with an update on current approaches to diagnosis and treatment of onychomycosis.[9] Onychomycosis is a common condition affecting 5.5% of the population worldwide and represents 20-40% of all onychopathies and about 30% of cutaneous mycotic infections.[10] Onychomycosis of fingernails may lead to pain, discomfort, and impaired/lost tactile functions. Toenail dystrophy can interfere with walking, exercise, or proper shoe fit. In addition, onychomycosis has both psychosocially and physically detrimental effects.[11]

NAIL DISORDERS:

1.Onycholysis: The nail becomes detached from its bed at the base and side, creating a space under the nail that accumulates dirt. Air under the nail may cause a grey-white colour but can vary from yellow to brown. If Pseudomonas aeruginosa grows underneath the nail, then green colour appears.

2.Paronychia: Paronychia is inflammation of the tissue around the fingernail, with pus accumulating between the cuticle and the nail matrix. The area may become swollen, red and tender. Acute paronychia is usually due to bacterial infection, particularly Staphylococcus aureus. Chronic paronychia may be associated with eczema or psoriasis. It is often due to Candida infection but other pathogens - eg, Pseudomonas species. (Producing a green or black discoloration) – may be the cause.

3.Psoriasis: Virtually all patients with psoriasis have nail involvement at some time and it occurs in 50% of cases at any given time.

4.Yellow Nail Syndrome: Yellow nail syndrome is characterized by slow-growing, excessively curved and thickened yellow nails which are associated with peripheral lymphoedema and exudative pleural effusions. Abnormalities include nail pits, transverse furrows, crumbling nail plate and roughened nail.Amorolfine nail lacquer contains the active substance amorolfine (as amorolfine hydrochloride), which belongs to a group of medicines known as antifungal. It kills a wide variety of fungi that can cause nail infections. Amorolfine nail lacquer is used to treat fungal infections of the nails. Amorolfine 5% w/v medicated nail lacquer contains 5.574gms of amorolfine hydrochloride per 100 ml equivalent to 5 gm (5%w/v) of amorolfine base. Its fungi static and fungicidal efficacy is based on the alteration of fungal cell membrane targeted primarily on stereo biosynthesis. The ergosterol content is reduced and at the same time unusual sterically nonpolar sterols accumulate. Amorolfine is a broad spectrum antimitotic. It is highly active against current or casual agents of onchomycosis.[12,13,14]

Structure and anatomy of human nail:

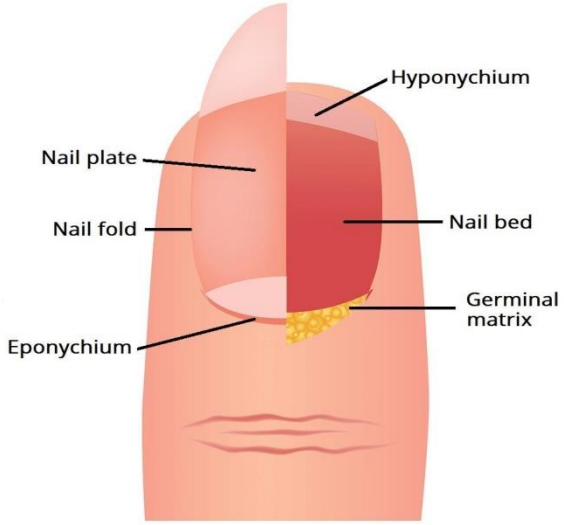

Figure. 1 [structure and anatomy of human nail [34]

Located on the distal part of each digit, Nails (with hair, sebaceous and sweat glands) are known to be appendages of the skin. Nails are the invagination of the outer layer of the skin, the Epidermis and composed of very small cells, called onychocytes, which are mainly made up of keratin, a fibrous protein. Human nail is composed of many parts like nail plate, nail bed, matrix, nail cuticle, eponychium,hyponichium, specialized ligaments and nail folds.[34]

Nail Plate: Nail plate is the hard translucent, most visible and functional part sits on and covers the nail bed and composed of keratin. Proximally and laterally the nail plate is surrounded by the nail folds, which covers its proximal and lateral margins. The nail plate is more porous than skin, hence water can pass through it more easily than through the skin. The nail plate looks like a single solid piece but it is made up of 100 layers of dead, flattened cells which are arise from the germinal matrix epithelium of the nail bed. The pinkish color of the plate is due to blood capillaries below the nail plate, which receives blood supply from ulnar and radial digital arteries. The Free edge or distal edge is the anterior cutting margin of the nail plate that extends over the tip of the finger and toe.

Bed: It is the living skin below nail plate or we can say that the area upon which the nail rests. It grows from the distal margin of lunula towards the epidermis of hyponichium (free edge) and looks pinkish due to blood capillaries visible through translucent nail plate. Bed epithelium (a thin layer of tissue) is act as junction between nail bed and nail epithelium. Nerves are also present in the nail bed.

Nail Matrix: The nail matrix is specialized epithelial structure that lies below the proximal nail fold. The nail matrix epithelium composed of basal cells which in turn differentiate into spinous cells and then into orthokeratotic cells that forms the nail plate. The nail matrix is also known as root of the fingernail. This portion composed most of the portion of the nail and the nail bed.

Lunula: It is the whitish visible semicircle (Half-moon) part at the base of the nail plate. At this half-moon part, the nail bed is so tightly packed with keratin that the capillaries are masked by the amount of keratin. The lunula is largest in the thumb and often absent in the little finger.

Cuticle and Eponychium: Generally, cuticle and eponychium create confusion with each other. They are not same. The cuticle is the dead skin (almost invisible) at the base of the finger nail or toenail and is often removed during manicure. But eponychium is the living skin that is present at the base of the nail plate and covers the matrix area. Cuticle seals the space between nail plate and the skin. This sealing prevents the entry of foreign particle and micro-organisms and helps in avoiding injury and infection.

Hyponichium: It is the most distal, soft, slightly thickened layer of skin that is located between the fingertip and the free edge of nail plate and forms a water proof protective barrier that prevents microorganisms from invading and infecting nail bed.

Nail Folds:
These are the folds of normal skin that surrounds the nail plate and forms the nail grooves which furrows on the side wall. The side wall is also known as lateral nail fold which is the skin overlapping the side of the nailSpecialized.

Ligaments: It is a tough band of fibrous tissue that attaches the nail bed and matrix bed to the underlying bone. These ligaments are situated at the base of the matrix and around the wedges of nail bed.[15]

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.[16]

Benefits of herbal nail polish [17]:-
1. Thicker, stronger, more durable nails.
2. Brittlefree nails.
3. Chip-resistant nails.
4. Break resistant nails.
5. Moisturized
6. Hydrated nails.[18]

PLANT SOURCE :

Biological source:

Clove (Syzygium aromaticum), a precious spice, is member of the Myrtaceae family which has beenemployed for centuries as a food preservative and medicine because of its antimicrobial and antioxidant properties. Syzygium is the largest genus of Myrtaceae family, comprising about 1200 to 1800 species of flowering plants, which are widely distributed in tropical and subtropical areas of Asia, Africa, Madagascar, and throughout Pacific and Oceanic regions. [19]

Figure: 2 clove [29]

Cloves contain appreciable amounts of volatile oil (used for flavouring foods and pharmaceuticals), which is mainly confined in aerial parts of plants. Clove is known by different vernacular names in different languages. It is known as qaranful (Arabic), Karamfil (Bulgarian), Ding xiang (Chinese), Kruidnagel (Danish), Garifalo (Greek), Mikhaki (Georgian), NelkeN (German), Szegfu (Hungarian), Cengkeh (Indonesian), Choji (Japanese), Jeong Hyang (Korean), Krustnaglinas (Latvian), Lwaang (Nepalese), Cravo da India (Portuguese), Mikhak (Persian), Kala (Pashto), Gvozdika (Russian), Clavo (Spanish).

SCIENTIFIC CLASSIFICATION [20]-

Kingdom : Plantae

Division : Tracheophyta

Class : Magnoliopsida

Order : Myrtales

Family : Myrtacea

HISTORY

Clove is an ancient spice, which is believed to be originated in the first century, before Christ. The first clue about clove's fragrance was given by the ancient Chinese (207 B.C. to 220 A.D.). At that time, a Chinese Physician wrote that court visitors were required to hold clove in their mouth to prevent the Emperor from visitor's bad breath. Cloves were traded to Europe by the Arabs in 4th century A.D. The origin and source of clove was a mystery, until the discovery of Indonesia or Moluccas Island, by Portuguese, in 16th century. In 17th century A.D., cloves were introduced to Sri Lanka. In 18th century A.D., cloves were established in India by East India Company. In European countries, there is a tradition to make "Pomanders" by studding oranges with clove buds, and to hang them around the homes, during Christmas, for decorative purpose and to spread fragrance. [21]

MORPHOLOGY AND ECOLOGY

Clove is a scented dried bud of Syzygium aromaticum tree, used as seasoning in food cuisines. S. aromaticum is an evergreen tree which grows upto a height of 8 to 12m; having large quadrangle leaves and cheerful flowers arranged in form of clusters. Young flower buds are of pale color and slowly changes to green, which changes to bright red when budsare ready for harvesting.[22] Harvesting should be done when buds have 1.5–2cm length, long calyxterminating in four closed petals (forming a tiny ball in the core) and spreading sepals. Clove growth requires well- drained, loamy, and organic matter rich soils. Constant temperature above 100C is crucial, while optimum temperature is around 20 to 300C. This species cannot tolerate waterlogged conditions. Areas having annual rainfall of 150 to 300cm are best for its growth.

Figure: 3 Clove flower [28]

Figure: 4 [30]

CHEMICAL COMPOSITION:

Clove represents one of the major vegetal sources of phenolic compounds as flavonoids, hydroxybenzoic acids, hydroxycinnamic acids and hydroxyphenyl propens. Eugenol is the main bioactive compound of clove, which is found in concentrations ranging from 9381.70 to14650.00 mg per 100 g of fresh plant material.[23]With regard to the phenolic acids, gallic acid is the compound found in higher concentration (783.50 mg/100 g fresh weight). However, other gallic acid derivatives as hydrolyzable tannins are present in higher concentrations (2375.8 mg/100 g). Other phenolic acids found in clove are the caffeic, ferulic, ellagic and salicylic acids. Flavonoids such as kaempferol, quercetin and its derivatives (glycosylated) are also found in cloves in lower concentrations. Concentrations up to 18% of essential oil can be found in the clove flower buds. Roughly, 89%of the clove essential oil is eugenol and 5% to 15% is eugenol acetate and β- cariofileno. [24]

PROPERTIES:

Anti fungal activity:

The present study indicates that clove oil and eugenol have considerable antifungal activity against clinically relevant fungi, including fluconazole-resistant strains, deserving further investigation for clinical application in the treatment of fungal infections. Studies have shown that clove essential oil is both fast and effective in killing fungal infections [25].

Anti-inflammatory activity:

Clove as a naturally available source of phytochemicals and free from any sort of side effects, the anti inflammatory nature of clove has been studied widely and it has been found that clove and its components help to reduce the inflammation and swelling at different sites. The active component of clove is eugenol modulate the signalling pathway and immune response and that's how it reduces the inflammation (Widowati et al., 2015). TNF-α is an important target of anti-inflammatory agent and by blocking one of the cytokines of TNF- α can get the work done. Clove oil attribute in treating the inflammation of dermal fibroblast (Han & Parker, 2017). In this way clove oil plays vital role in so many physiological and biological processes.[26]

Antioxidant activity:

A study was performed to assess the antioxidant potential of aqueous and alcohol extracts of some selected spices including onion, garlic, pepper, cinnamon, mint, ginger, and clove. Generally phenolic and flavonoids are responsible for antioxidant activities of the oil.[27] All spices inhibited lipid oxidation in a dose dependent manner. Among all, clove showed maximum, whereas, onion showed minimum inhibitory potential.[28] Antioxidant activities of clove, sage, and oregano essential oils were evaluated using DPPH (2,2-diphenyl-1picrylhydrazyl) free radical quenching, BCB (β-carotene bleaching), and FRP (Fe(lll) reducing power) methods. Butylated hydroxytoluene was used as standard antioxidant. Essential oils were added to soybean oil at doses of 0.006 and 0.01g/ml, for thirty days, at accelerated oxidation level. Among all examined oils, the clove oil showed more potent.[29]

Anti Bactrial Activity:

This research was conducted againsts gram-positives and gramnegatives bacteria, pathogenic fish bacteria isolated from Korea's cultivated oliveflounder. CEO includes 7 chemical compounds including 83.63 percent eugenol disc - diffusion assay, micro, mbc test indicates that ceo eugenol inhibits growth gram positive and gram negativebacteria. [30]

PREPARATION OF NAIL PAINT :

Chemical used Table. 1 [31]

Sr.No	Name of Ingredients	Properties
1.	Clove oil	Antimicrobial
2.	Poly vinyl pyrrolidone	Flim forming agent
3.	Xanthan gum	Thickening agent
4.	Castor oil	Plasticizer
5.	Etanol	Solvent
6.	Turmeric	Colouring agent

Table 2: Formulation of nail polish [31,32]

Ingredient	Qantity for 10 ml
Clove oil	3ml
Poly vinyl prrolidone	5g
Xanthan gum	3g
Castor oil	1ml
Turmeric	1g

PROCEDURE:

- Accurately weigh the film forming agent and transfer it into a Pestle and bowl
- Add the solvent and macerate.
- Add the thickening agent into it to form a smooth paste.
- Followed by the addition of plasticizer and antimicrobial agent and add colouring agent
- Triturate until proper consistency is obtained.[33,34]

CONCLUSION:

Herbal nail polish made from clove (Syzygium aromaticum) is a promising treatment option for onychomycosis, a fungal infection of the nails. The antifungal properties of clove oil, a key ingredient in the nail polish, have been shown to inhibit the growth of fungal pathogens, including Trichophyton, Microsporum, and Epidermophyton. Herbal nail polish made from clove is a promising treatment option for onychomycosis, offering a natural and safe alternative to conventional treatments. Further research is needed to fully understand its efficacy and safety, but the antifungal properties of clove oil make it a valuable ingredient in the treatment of fungal nail infections. The study reveals that the developed nail polish with herbal active ingredient was comparatively better than other formulations because of its antimicrobial, antiviral, anaesthetic, analgesic and antioxidant activity when applied on skin.

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