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A REVIEW ON THE EFFICACY OF LATEX-PRODUCING PLANTS IN WART REMOVAL: A COMPARATIVE STUDY OF EUPHORBIA HIRTA AND CALOTROPIS GIGANTEA

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ABSTRACT

Warts are often considered to be non-threatening, but they still can cause a lot of discomfort, disgrace the appearance of a person, and consequently cause psychological distress.[1] The warts are easily treated with the use of cryotherapy, electrosurgery, and application of keratolytic agents, but they come with a lot of drawbacks, such as pain, being more expensive, taking longer to treat and reoccurrence and scarring risk is also high. Therefore, the quest for safer, inexpensive, and plant-based alternatives that are derived from traditional medicine is gaining momentum.[2] The latex-producing medicinal plants have been used for the treatment of warts in Ayurvedic, Siddha, and folk medicine due to their combined properties, such as keratolytic, caustic, antiviral, and antimicrobial effects, for a long time. The two plants that stand out in this context are Euphorbia hirta and Calotropis gigantean for their traditional use in wart elimination. Through this review, a detailed and comparative analysis of these two raw latex-producing plants will be provided, where the emphasis will be on their phytochemical composition, modes of action, traditional uses, effectiveness, and safety profiles.[3] In summary, the review provides evidence of considering the two plants, Euphorbia hirta and Calotropis gigantea, for their management through herbals. It is pointed out that scientific validation through research is

needed, and then clinical formulation development to ensure safe, standardised and clinically acceptable plant-based therapies for wart treatment.[3]

KEYWORDS: *Warts, Euphorbia hirta, Calotropis gigantea, keratolytic effect, Human papilloviruses (HPV), Anti-viral activity.*

INTRODUCTION

Warts are benign (noncancerous) skin growths caused by infection with the human papillomavirus (HPV), a DNA virus that infects the basal layer of the epidermis. They are often contagious through direct or indirect contact. They affect millions worldwide and occur across all age groups, with higher prevalence in children, adolescents and immunocompromised individuals.[4] Even though painful, warts are normally not life-threatening; however, they might cause discomfort, cosmetic problems, and psychosocial distress, mainly on exposed sites to smooth, flat growths. Current therapies include cryotherapy, electrosurgery, keratolytic agents such as salicylic acid, and immunotherapy; however, despite their overall effectiveness, most treatments are significantly limited by various drawbacks, including high cost, painful procedures, protracted courses of treatment, frequent recurrence, or the possibility of scarring. Such as the hands, face, and feet, and vary in appearance from rough and bumpy to flat and smooth.[5]

Warts have a broad range of clinical appearances, ranging from rough and verrucous lesions. As a result, the demand for safer, affordable, and non-invasive alternatives has increased, particularly in developing countries where access to dermatological care may be limited.[6]

India has a long tradition of using different parts of medicinal plants to treat various diseases. Ancient medical systems like Ayurveda, Siddha, and Unani have been practised for hundreds of years, and even today, some Ayurvedic-based medicines are used to treat modern diseases and are sold commercially. Although modern synthetic drugs are effective, they are often expensive and not affordable for many people. Because of this, medicinal plants play an important role as they provide raw materials for many modern medicines.[7]

Worldwide, about 70,000 plant species are used for medicinal purposes. These are used for medicinal purposes. These plants work because they contain complex chemical compounds that have healing properties.

Traditionally, herbal remedies have been employed for centuries in managing various skin conditions, including warts. Among them, latex-producing plants are widely recognised for their potent keratolytic, caustic, and antiviral properties. Plant latex is a complex biological secretion composed of enzymes, alkaloids, terpenoids, resins, phenolic compounds, and other bioactive metabolites capable of exerting pharmacological effects on diseased tissue. In various traditional medicine systems such as Ayurveda, Siddha, and folk medicine, latex has been applied topically to dissolve wart tissue, stimulating local inflammation, and heightening innate immune responses that facilitate the destruction of HPV-infected cells. Despite their long-standing use in traditional modes of healing, scientific evaluation of these latex-producing plants remains scant; hence, there is a need for a systematic review and comparative analysis.[8]

The most outstanding latex-rich plants for the treatment of warts in traditional Indian medicine are Euphorbia hirta and Calotropis gigantea. Euphorbia hirta is considered relatively safer due to its mild keratolytic and anti-inflammatory action, hence suitable for sensitive skin. On the other side, Calotropis gigantea or “Erukku” contains a very irritating latex with high proteolytic and cytotoxic action that rapidly destroys wart tissue, although it is at higher risk for skin irritation. These two plants vary significantly in phytochemical composition, mechanism of action, potency, and safety profile, making them ideal candidates for comparative evaluation. This review compares and critically analyses the efficacy of Euphorbia hirta and Calotropis gigantea in wart removal by examining their phytochemistry, pharmacological mechanisms, traditional uses, and scientific evidence. By providing an overall view of these latex-producing plants, this review identifies their therapeutic values, advantages, limitations, and possible role in the future development of phototherapeutic formulations for the management of warts.[9]

DISEASE BACKGROUND

Warts, which are hyperproliferative, non—cancerous epidermal growth. They arise from viral stimulation of keratinocyte growth and keratin production.

ETIOLOGY

Human papilloviruses, a DNA virus that comes in more than 100 varieties, are the cause of warts. Common skin warts are mainly linked to HPV types 1, 2, 3, 4, 10, 27 and 57. The spread of infection is facilitated by direct contact, autoinoculation, and contaminated

surfaces, especially in moist environments. Risk factors include skin trauma, weakened immunity, frequent contact with wet hands, and habitual nail biting.[10]

PATHOPHYSIOLOGY

The virus enters the body through micro-cuts or abrasions and infects the basal layer of the epidermis. Thickening and hyperkeratosis, a disorder marked by an excess of keratin, are caused by the virus's increased cell replication, which results in acanthosis. As a result, distinct lesions known as warts are produced. The virus rarely spreads throughout the body: instead, it stays localised at the site of infection. This results in well-defined lesions referred to as warts. In most cases, a virus will stay isolated in the region of its entry and does not spread systemically.[11]

HPV infection

The virus enters the body through the skin and infects basal keratinocytes.

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HPV DNA replicates within the cells

↓

increased keratinocyte proliferation

↓

hyperkeratosis & acanthosis (thickening of skin)

↓

visible wart formation (raised rough lesion)

↓

Wart persists due to the immune system's delayed reaction.

TYPES OF WARTS

COMMON WARTS (verrucae vulgaris)

Statistics in words verrucae vulgaris, or common warts usually asymptomatic, but when discovered on weight-bearing areas, they may occasionally cause mild discomfort. They show up as firm, round, or irregular, sharply defined nodules that range in size from 2 to 10mm and are light grey, yellow, brown, or grey-black. Frequently seen on the face, knees, elbows and feet.

FILIFORM WARTS

Usually found on the lips, face, neck, or eyelids, these warts are long, narrow growths that resemble fronds. Usually, they don't cause any symptoms. This unique form of common warts is harmless and readily curable.

FLAT WARTS

These are smooth, flat-topped papules that are yellow-brown, pink, or flesh-coloured, often occurring on the face and along scratch marks. They are more prevalent among children and young adults and can develop through autoinoculation.

PALMAR AND PLANTAR WARTS

Appear on the pressure-flattened palms and soles. They can be very painful and can make walking and/or standing uncomfortable for the person with warts.

MOSAICS WARTS

Mosaics are made up of many smaller plantar warts (made into one large hypopigmented area) that come together to form a single mass. Mosaic warts are usually just as tender as other types of plantar warts.

CONVENTIONAL TREATMENT OF WARTS

CRYOTHERAPY

Cryotherapy is one of the conventional medical treatments for removing warts. It involves extremely low temperature, usually with liquid nitrogen at -196 °C applied directly on the wart, which freezes, destroys and eliminates HPV-infected tissue.Rapid freezing leads to the formation of ice crystals inside skin cells. Rupturing cell membranes, cutting blood supply and eventually controlled necrosis of tissues- not all the dead of wart tissue. The body then naturally sheds the dead tissue, allowing new healthy skin to form.It also provokes a local immune response; cryotherapy helps the body distinguish and help fight off a virus, in particular, human papillomavirus, which causes warts. This dual action at the levels of tissue destruction and immune activation makes cryotherapy one of the most common clinical treatment options for different types of warts.[12]

ADVANTAGES OF CRYOTHERAPY

1) QUICK PROCEDURE: each session is 10 to 30seconds, and it is very convenient for clinical use.

2) Effective for many types of warts
3) There is a very low risk of permanent scars
4) It is safe for most age groups

SIDE EFFECTS

1. PAIN AND BURNING SENSATION: The procedure may be painful during and after the cryotherapy process.
2. Skin irritation & swelling
3. It may cause hyperpigmentation
4. local infection (rare) possibility of bacterial infection

ELECTROSURGERY

Electrosurgery is a method that makes use of electric current to perform three functions on the wart; that is, cutting, burning or destroying the wart completely. It involves

Electrodesiccation - using electric current, the patient's skin is dried and the tissue is destroyed.

Electrocautery- burning the wart by using an electrically heated metal tip.

Curettage + electrosurgery - the wart is scraped (curettage), then an electric current is directed at it to destroy any tissue that may be left.[13]

ADVANTAGES

1) It is highly effective for stubborn warts
2) Immediate wart removal
3) Good for large, resistant or thick warts
4) Local anaesthesia is given- painless during the procedure

SIDE EFFECTS

1. It can cause pain after the procedure
2. Scarring is more likely to happen with this surgical procedure as compared with cryotherapy or topical agents.
3. Delayed wound healing after the surgery, and it takes 1-2 weeks for the new skin to completely cover the area.
4. It can also occur as hyperpigmentation.

KERATOLYTIC THERAPY

This therapy represents a method of treatment with a drug such as salicylic acid that breaks down and removes the thickened layer of keratin on a wart. The common keratolytic agents are

- Salicylic acid (10-40%) - most commonly used
- Lactic acid
- Urea (high concentration)
- Trichloroacetic acid (TCA) -stronger chemical
- Glycolic acid (less common)

It is ideal for small, resistant and superficial warts. And it is extremely useful for common warts and plantar warts. Typically employed as a first-line because it is safe and inexpensive. It acts by diffusing a chemical into the stratum corneum or thickened skin. It breaks down keratin, softens and dissolves scar tissue. It slowly removes layers of infected skin, and continuous use of things out the wart. Aids in eliminating cells infected with HPV - immune system response.[14]

ADVANTAGES OF KERATOLYTIC THERAPY

1) Non-invasive: there would be no cutting and no freezing.
2) It is extremely inexpensive.
3) easy application daily at home
4) suitable for children, typically mild skin irritation
5) can be combined with other treatments, and it works well with cryotherapy.

SIDEEFECTS

1. Slow treatment: it requires daily usage for 6-12 weeks.
2. Skin irritation -redness, burning, dryness from acids
3. It may not eradicate it completely-return of the wart.
4. Not suited for patients with diabetes, circulatory problems and neuropathy.

PLANT PROFILE

EUPHORBIA HIRTA

Botanical description

Scientific Name: Euphorbia hirta

Family: Euphorbiaceae

Common Name: Asthma plant, snake weed, dudhi, tawa-tawa

Latex: milky, white, irritant-type latex exuded from the stem/leaves when broken.

TRADITIONAL USE

The conventional application of E. hirta includes informal medical practices such as Ayurveda/Siddha, as well as utilising it in our daily lives. The plant has as many medicinal properties associated with its use to treat respiratory ailments, such as asthma, bronchitis, cold-related coughing episodes, etc, which may relate to its bronchodilator effect and ability to facilitate phlegm clearance. e, hirta has been applied externally as a latex and or paste on warts, boils, open cut wounds/fungal infections, etc, due to its ability to cause both keratinolytic activity and antimicrobial activity.[15]

Gastrointestinal diseases such as diarrhoea, dysentery, intestinal worm infestations or abdominal pain can all be treated using E. hirta. The anti-inflammatory and analgesic activities of E. hirta are applied externally to reduce swelling from trauma, pain and inflammation. Finally, E. hirta is used to treat minor skin and respiratory bacterial and fungal infections due to its antimicrobial, antibacterial and anti-fungal properties. Given that part of our thesis focuses on the medicinal attributes of plants and treating respiratory conditions, you may find E. hirta to be a good focus based on its historical use to treat warts or skin-related conditions.

Latex-containing plants have long been used in many forms of traditional medicine to treat warts, and among these plants, Euphorbia hirta has gained considerable recognition not only for its use in folk medicine but also through scientific research confirming its many bioactive compounds. The Anti-wart effect derives from its milky latex and its leaves and other ground parts. Traditionally, it is applied directly on top of the wart using fresh latex harvested from the plant. The latex contains numerous phytochemicals, such as flavonoids, tannins, phenolic compounds, triterpenoids and diterpenes, that together are responsible for the plant's ability to cure.

Keratolytic activity is one mechanism through which E. hirta acts on warts. The bioactive constituents of this plant break seen excess keratin (a protein found predominantly in skin cells) in the wart, causing the wart to gradually soften, dry out, and eventually fall off by itself. This action targets the hyperkeratosis (extra proliferation of keratinocytes) associated

with warts I am non-invasive manner. E hirta demonstrates a second important aspect of wart control by displaying an ability to inhibit the replication of the HPV virus. By reducing the amount of virus present at the site of infection and by inhibiting viral replication, it can control the continuous proliferation of HPV-infected cells. Additionally, the antimicrobial properties of this plant also protect against secondary bacterial or fungal infections that may occur after treatment.[16]

CALOTROPIS GIGANTEA

Botanical description

Scientific Name: Calotropis gigantea

Common Name: crown flower/Giant

Family: Apocynaceae

Latex: thick white latex present throughout the plant, contains strong irritants and proteolytic compounds.

TRADITIONAL USE

It is an important medicinal plant and is a major part of many of the traditional systems of medicine, including Ayurveda, Siddha, Unani and folk medicine in India and Southeast Asia. The milky latex produced from the plant is a prominent feature of the plant, and the large, bluish purple or white flowers have great recognition and use. Almost all parts of the plant (latex, leaf, root, bark, flower) are used for therapeutic purposes. The milky latex is primarily used in traditional medicine for its caustic and keratolytic effects on various skin disorders. Due to these properties, it is frequently used externally to eliminate warts, corns, and calluses. In addition to skin diseases, the milky latex has been used to treat eczema, ringworm, scabies, and other chronic skin infections.[17]

The milky latex has also been shown to have antimicrobial properties that aid in preventing secondary infections and assisting in the healing of the damaged skin. It is also used for its analgesic and anti-inflammatory effects. The common indications for this use of Calotropis gigantea are rheumatism, arthritis, muscle pain and other conditions.

It treats warts because of the healing properties of its milky latex. It directly targets this thickened tissue, promoting the gradual destruction and removal of warts. The ability of Calotropis gigantea to combat warts mainly comes from its keratolytic and caustic properties. When applied carefully to the skin, the latex breaks down the excess keratin found in wart

tissue. This process leads to softening, shrinkage, and eventually shedding of the lesion. The proteolytic enzymes in the latex break down the protein structure of the wart, while its caustic effect causes localised tissue damage, allowing for wart removal without the need for surgery.

The composition of the latex is essential for its healing action. The latex includes cardiac glycosides like calotropin, uscharin and calotoxin, which can harm abnormal cells. It also has proteolytic enzymes such as calotropins that break down keratin and other proteins. Moreover, the latex is rich in triterpenoids, flavonoids, alkaloids, and phenolic compounds, which increase its biological effects. These components work together to provide keratolytic, antiviral and antimicrobial benefits.[18]

In addition to breaking down keratin, the latex shows antiviral and antimicrobial properties, which aid in managing warts. Its antiviral action helps reduce HPV activity at the infection site, while its antimicrobial features help prevent secondary infections during healing. The presence of anti-inflammatory compounds further lessens irritation and supports tissue repair after the wart has been removed. Traditional practices suggest that repeated. Careful applications of the latex lead to slow wart regression. However, because of its strong properties, improper or excessive application can cause skin irritation, blisters or burns. Thus, traditional healers recommend using the latex minimally, focusing only on the wart and avoiding contact with healthy skin around it.[19]

In conclusion, the ability of Calotropis gigantea to treat warts is well-supported by the unique makeup of its latex, which combines keratolytic enzymes, toxic cardiac glycosides and antimicrobial plant compounds. These compounds work together to destroy wart tissue, reduce viral activity and aid healing, making a valuable traditional remedy for wart treatment when used carefully.[20]

COMPARATIVE DISCUSSION OF TWO PLANTS

Flow chart-Keratolytic Action (Both plants)

↓

The wart is treated with latex.

↓

Stratum corneum (layer of keratin) contact

↓

Irritant phytochemicals penetrate the skin.

↓

(E. hirta ---- mild diterpenes and flavonoids

↓

C. gigantea----- strong cardenolides and calotropin) ion of bas

↓

Keratin structure disrupted (broken keratin bonds and softening of hard tissue.

↓

Dead cells degradation by proteolytic enzymes

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Outer layers of the wart peeling/shedding

↓

Wart size gradually reduced.

↓

Complete removal of wart tissue

PHYTOCHEMICAL CONSTITUENTS.

Phytochemical	**EUPHORBIA HIRTA**	**CALOTROPIS GIGANTEA**	**USES**
Flavonoids	Mild Presence	Present	Anti-viral activity against HPV, anti-inflammatory effect, and reduction of redness and swelling around warts.
Tannins	Present	Present	Astringent action causes the shrinkage of wart tissue, promotes drying and detachment of warts.
Terpenoids	Mild Presence	Present	Anti-microbial action, prevents secondary bacterial infection, supports tissue healing.
Phenolic compounds	Present	Present	Anti-oxidant protection prevents damage to the surrounding healthy skin.
Alkaloids	Mild presence	Strong presence	Cytotoxic effect on abnormal cells, which helps in the destruction of wart tissue
Saponins	Present	Present	Enhance penetration of active compounds into skin, and improve keratolytic action.
Latex enzyme	Mild latex	Rich latex	Proteolytic and keratolytic action break down excess keratin in warts.
Cardenolides (cardiac glycosides)	Absent	Present	Cause controlled necrosis, support

DISCUSSION

Euphorbia hirta is the one which is extremely safe due to its latex is rather mild and less irritant, and very low chance of burns or blistering. It has a lower risk of allergic reaction, and

it can be used on sensitive skin areas. Where, Calotropis gigantea, on the contrary, has a greater risk, its strong irritant latex might cause blisters, redness, and even hyperpigmentation. It can cause chemical burns if overapplied, and it is not suitable for sensitive skin or children.

But the Calotropis gigantea was the fastest acting plant among the two due to high concentration of cardenolides (calotropin, uscharin), potent keratolytic and cytotoxic effects. The aforementioned compounds considerably dismantle wart keratin and, at the same time, kill the infected cells by HPV, allowing the wart to shrink quite rapidly. Euphorbia hirta took its time, and the reason for that was the presence of mild flavonoids and triterpenoids, which caused gentle keratolysis mainly through antiviral and anti-inflammatory pathways. So, more applications and time are needed for the removal of warts.[21]

CONCLUSION

A far-reaching comparison has led to the conclusion that both Euphorbia hirta and Calotropis gigantea possess the same anti-wart potential and can thus be classified as the major plants in this regard. The aforementioned methods and phytochemical evidence further support the argument. The two of them are similar in their less-frequent application properties, but the justification for this is that each of them presents certain advantages depending on the clinical situation.[22]

Calotropis gigantea does this rapidly and vigorously by getting rid of warts through the combined action of the coagulant cardenolides calotropin and uscharin, and the potent proteolytic enzymes calotropin. The mentioned compounds cause both keratin destruction and cytotoxicity to the virus-infected cells, which then leads to the melting away of the wart and its detachment being done quickly. Thus, Calotropis gigantea is particularly perfect for those thick, hard and persistent warts. Nevertheless, the vast extent of its irritating nature, plus burns, blistering and post-inflammatory pigmentation, are the main risks that have very limited its safe use, especially for children and those with sensitive skin.[23]

By contrast, Euphorbia hirta provides a less hazardous but longer anti-wart treatment. The latex of the plant is composed of mild flavonoids, triterpenoids and phenolic compounds that together produce mild keratolysis plus antiviral and anti-inflammatory effects. This leads to soft wart shrinkage with minimal tissue destruction. In this way, the need for frequent re-application comes in, yet the common drawback of irritation and absorption risk that is so

usual with other treatments is not present. In this sense, Euphorbia hirta is more human-like.[24]

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