RESEARCH PAPER

Development and Characterization of a Polyherbal Cream for Anti-Inflammatory and Anti-Pruritic Activity in Chickenpox

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ABSTRACT

Varicella-zoster virus causes chickenpox, which leads to a red rash that forms blisters and then crusts over. It spreads rapidly through direct or indirect contact with an infected person. Despite being typically benign and self-limiting; serious complications can sometimes occur due to the varicella zoster virus. The use of natural, plant-based remedies in traditional medicine has gained attention for their potential benefits in treating various viral infections. Neem, aloevera, liquorice, tulsi commonly found in the Indian subcontinent, have long been used in Ayurvedic and folk medicine for their wide range of therapeutic properties. This research explores the use of neem extract, aloevera, tulsi, liquorice in the treat of viral infections such as chickenpox (varicella). These diseases, caused by viruses from the herpes family, have historically posed significant health challenges, herbal plant remain valuable complementary remedies in many cultures. The soothing, anti-inflammatory and antibacterial properties of these herbal plant make them effective in reducing itchiness, preventing infections, and minimizing scars when applied topically.

Keywords – chickenpox, liquorice, neem, aloevera, tulsi

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INTRODUCTION

CHICKENPOX

Both varicella and chickenpox are infectious diseases brought on by varicella-zoster virus.[1] Everywhere in the globe, coughing, sneezing, touch with skin sores can spread the airborne disease chickenpox. The average incubation time is roughly two weeks, and symptoms start 10 to 21 days after exposure. Chickenpox lead to a skin eruption forming itchy vesicular lesion that form a crust (Chickenpox Varicella). The rash initially appears on the chest back and face before extending to other area , accompanied by fever, fatigue, pharyngitis, and headaches, usually lasting 5 to 7 days. The virus may spread 1 up to two days before the rash first shows till every lesion has formed a scab . Complications include pneumonia, brain inflammation, bacterial skin infections[2]. The illness tends to be more serious in adult compared to children the diagnosis of chickenpox based on the presenting symptoms and verified through polymerase chain reaction analysis of vesicular fluid or crust materials .antibody assay may be performed to determine immune status . while varicella reinfection is possible it is typically subclinical and less severe than the primary episode . following its introduction in 1995 the varicella vaccine has substantially reduced disease occurrence and related complication, conferring 70-90% efficacy in preventing infection and nearly 95% effectiveness against severe illness. Standard pediatric immunization is advised and administration within 72 hour of exposure can improve disease outcomes in children [3].

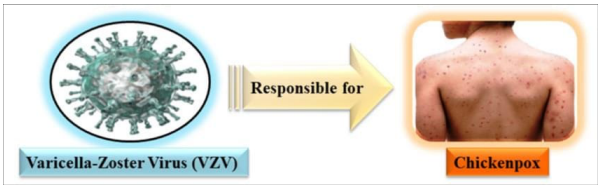

Fig.1 –The Varicella- Zoster Virus(VZV) which cause chickenpox

Epidemiology

VZV appears everywhere and is endemic in populations large enough to support year – round transmission ,with epidemics taking place every 2 to 3 years. compared to other viral diseases like measles and poliomyelitis VZV appears to be disease of low significance [4,5] It has been found to occur commonly in adults as well as frequently in children under the age of 10. In temperate regions, it is significantly more social in the winter and spring than in the summer. Although VZV is often not a dangerous illness, it can have devastating consequences for adults and those with impaired immune systems [6].

Etiology

Chickenpox is caused by VZV, a herpes virus with worldwide distribution. The virus establishes latency after primary infection, a feature unique to most herpes viruses.[7] Chickenpox is acquired by inhalation of infected aerosolized droplets. This virus is highly contagious and can spread rapidly. The initial infection is in the mucosa of the upper airways. The virus enters the circulation after 2 to 6 days, and another bout of viremia occurs in 10 to 12 days. At this time, the characteristic vesicles appear. Immunoglobulin (Ig)A , IgM, and IgG antibodies are produced, but the IgG antibodies confer lifelong immunity. After the primary infection, varicella localizes to sensory nerves and may reactivate later as shingles

Risk Factor

Certain demographic and immunological factors contribute to the risk of contracting chickenpox. Age is a significant determinant, with young
children being more susceptible to infection. However adolescents and adults, particularly those who have never been infected before or vaccinated remain under the risk of severe complications [8] immune compromised individuals, including those with HIV, malignancies, or transplant recipients on immunosuppressive therapy, face a higher risk of severe and disseminated varicella. Pregnant women who contract chickenpox are also at increased risk of complications, as the virus can cause congenital varicella syndrome when transmitted to the fetus.

Sign and Symptoms

The symptoms of chickenpox typically include:

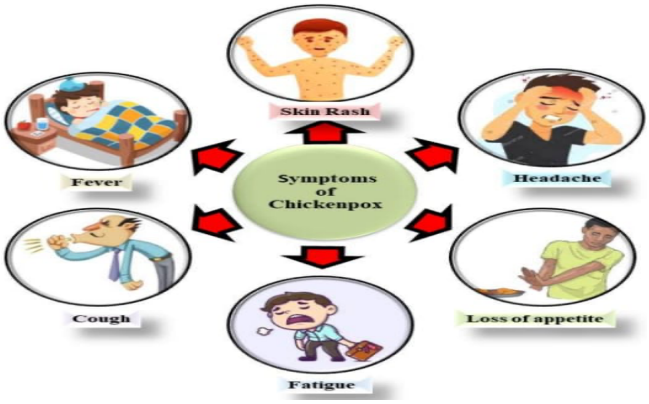

Fig.2 – The typical symptoms of chicken pox

Rash

Starts as red spots that develop into fluid-filled blisters and eventually crust over.

Fever

Mild to moderate fever.

Fatigue

General tiredness and malaise.

Itching

The rash is usually itchy, leading to discomfort.

Other Symptoms - Loss of appetite, headache, and muscle aches

Pathophysilogy

The causative agent, VZV, belongs to the human herpesvirus subfamily Alphaherpesvirinae and is a deoxyribonucleic acid virus similar to all herpesviruses. The virus invades via the respiratory system (conjunctival or upper respiratory mucosa) and establishes itself in the upper respiratory tract. Viral replication occurs in regional lymph nodes within 2 to 4 days; then, 4 to 6 days later, primary viremia disseminates the virus to reticuloendothelial cells in the spleen, liver, and other locations.

After a week, a secondary viremia propagates the virus to the internal organs and skin, resulting in the characteristic skin lesions. This viremia disseminates the virus to the respiratory regions and facilitates the transmission of varicella before the onset of the rash. During this period, infections of the central nervous system or liver may arise, including encephalitis, hepatitis, or pneumonia.[9]

Varicella can contribute to humoral and cell-mediated immune responses. These responses elicit enduring immunity. Individuals may experience recurrent subclinical infections; however, secondary episodes of chickenpox are exceedingly uncommon in immunocompetent individuals. Reexposure and subclinical infections may enhance the immunity developed following a chickenpox episode. Exposure causes the production of host IgG, IgM, and IgA. IgG antibodies persist for life and confer immunity. Cell-mediated immune responses are important in limiting the duration of primary varicella infection. After primary infection, varicella is theorized to spread from mucosal and epidermal lesions to local sensory nerves; it then remains latent in the dorsal ganglion cells of the sensory nerves. The immune system keeps the virus in check. However, reactivation can still occur later in life, resulting in the clinically distinct syndrome of herpes zoster (shingles).[10][11]

Phases Of The Varicell – Zoster Virus Infection

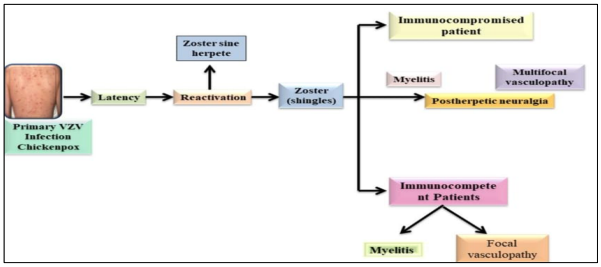

Fig. 3 – General chickenpox pathophysiology

Primary infection phase

VZV the oral pharynx (tonsils) after entering. When T-cells are infected with VZV, the virus multiplies and is released into the bloodstream, where it spreads towards the skin and potentially other organs. Innate immunity regulates the early stages of infections. To promote skin trafficking, VZV alters a variety of T-cell populations. The DNA of VZV may be found in the s T-Cells (viraemia) as soon for 10 days before a rash appears, and it can remain for a week after that.[12][13]

Latency infection phase

VZV is inactive in the neurons of the intestinal, cranial, autonomic, and dorsal root ganglia. To create the zoster (shingle), latent cases may reactivate . long thought to penetrate epidermal nerve ending during varicell travel retrogradly along axons and access neuronal cell bodies within the ganglia is how VZV is said to spread[14]

Herbal cream

Herbal creams, referred to here as products, are developed using various approved pharmaceutical ingredients to create a base that incorporates one or more herbal components, offering specific benefits. These are termed Herbal formulation[15] When natural herbs and their derivatives are utilized for their pharmaceutical properties in product preparation, it has spurred consumer demand for natural products and extracts in cosmetic formulations [16]. Creams are semisolid preparations intended for external application with friction. Ayurveda one of the most ancient systems of traditional medicine uses plants and their extracts from different parts for treating and managing various diseases and infections [17]. Historically, Nyctanthes arbor-tristis has been recognized as one of the oldest holistic, sacred, and traditional remedies. The medicinal herb part of the oleaceae family , is mentioned in these Vishnu Purana and and act as highly valued for treating various diseases, particularly rheumatoid arthritis, as it helps reduce pain and inflammation [18]. The plant contains secondary metabolites with diverse medicinal activities that contribute to strength, texture, and other benefits. Every part of the plant has medicinal value, making it commercially valuable. Further research into these phytochemicals has shown

Table 1 –Application of Herbal Phytomedicines

Herbal phytomedicine	Potent phytoconstituent	Part used
Neem	Nimibidin, Azadirachtin	Leaves, barks
Aloevera	Aloin ,barbaloin	Leaves
Liquorice	Glabridin, liquiritin	Root, barks
Tulsi	Volatile oil, flavonoid	Leaves

potential for treating various diseases, including hepatoprotective, antiviral, antifungal, antipyretic, antihistaminic, antimalarial, antibacterial, anti-inflammatory, and antioxidant activities [19].

Ideal Properties of Herbal Cream [20-21]

1. It should not produce any toxic effects upon application.
2. It should provide an emollient effect.
3. It should spread uniformly on the skin surface.
4. It requires preservatives to extend its shelf life.
5. It should be compatible with the skin's pH.

Advantages of Herbal Cream [22-23]

1. Rehydrates dry skin.
2. Replenishes extra dry or rough spots on the skin.
3. Smooths calluses.

4. Feels and smells pleasant.
5. Aids in relaxation.

Ingredients of formulation

Neem

For ages, traditional Indian medicine has used neem (Azadirachta indica), sometimes known as the "village pharmacy," particularly in the context of Ayurvedic, Unani, and Siddha therapies. It is well known for its therapeutic qualities, especially when it comes to skin care. diseases and infections, including viral conditions such as chickenpox and smallpox. Historical records indicate that neem has been a staple in management of viral infection, long before these advent vaccines or modern antiviral medications. Neem leaves were often boiled and used in baths or applied as pastes to help relieve the intense itching and irritation caused by the rashes. In regions affected by smallpox out breaks, neem leaves were used to prepare medicinal poultices applied to the skin, believed to reduce fever and promote faster healing. The plant's antibacterial and anti-inflammatory properties were also exploited to prevent secondary bacterial infections, a common complication in both chickenpox and smallpox patients[24] . The history of neem's use in treating viral infections like chickenpox and smallpox highlights the plant's enduring importance in traditional medicine. It acts as a link between contemporary research and traditional healing methods. into plant-based antiviral treatments, encouraging further study into its therapeutic potential[25].

Uses

- Relieving itching and soothing the skin
- Preventing secondry infections
- Reducing scarring
- Reducing body heat

Fig. 4 – Neem

Benefits

- Reduces pimples and acne moles
- Antibacterial activity
- Anti-malaria effect
- Anti-ulcer effect[26].

Aloevera

Early egyptian papyri and Mesopotamian tablets references aloe- vera for its antimicrobial , dermatological and mild laxative properties [27]. Cleopatra is traditionally believed to have incorporated aloe vera based preparations in to her beauty regimen [28] historical tradition holds that alexander the great occupied socotra to obtained aloe for the treatment of injured troops [29] in both traditional chinese medicine and Ayurveda , aloe vera holds therapeutic significance, chinese medical texts describe it as a cold , bitter remedy with purgative and heat clearing action particularly indicated and constipation due to internal heat [30] today aloe vera gel is widely utilized in a variety of dermatological products including moisturizers , sun blocks and cosmetic preparation [31]. The cosmetics use of gel is often justified by claims that it exhibits anti aging activity comparable to vitamin A based compounds [32] . It is a wonder plant for beauty because it includes more than 20 different types of amino acids and sufficient amounts of calcium, magnesium, sodium, and other minerals. This is a basic definition of in beauty. Scratching and Blisters: Aloe vera's anti-itch and blister-healing effects.Vitamin C, which has been discovered in aloe vera, creates happy, healthy skin. Aloe vera's part in skin aging is to create collagen and elastin. Some proteins are essential for anti-aging skin. Because aloe vera has anti-inflammatory and anti-viral propertie it benefits in the removal scars. Acne scars can be decreased by using a lotion containing aloe vera. Because aloe vera gel has so many benefits for the skin. This natural aloe vera cream helps to cure and hydrate skin. It can be used as a

moisturizer, a calming post-sun lotion, or at bedtime.[33]

Fig. 5 – Aloe vera

Uses

- Soothing itching and redness
- Anti-inflammatory , anti- microbial properties
- Preventing infection
- Moisturizing the skin

Liquorice

The plant Glycyrrhiza glabra, also known as liquorice, belongs to the Fabaceae family. Its ethnopharmacological properties have been studied all over the world. Glycyrrhizin, its active metabolite, has a variety of applications, including those as an mucolytic , mucosal protectine and mild bowel regulating properties , antidiabetic, antiviral, antitussive, antioxidant with depigmenting properties . These applications open up new avenues for investigation and the identification of the plant's powerful effects. Because the primary component of G. galabra, glabridin, inhibits melanoma cell tyrosine B16, it can be utilized to successfully lighten pigment. Another important component, fluidity, disperses melanin from its active site and has skin-lightening and antioxidant properties the plant derived extract is incorporated into skincare products for managing hyperpigmentation and shielding against uv induced damage [34-35]. According to the experts, the root extract can be used to formulate oily creams that consist of coconut oil , beeswax, surface active agents ,glycerine and aqueous base . This combination of ingredients helps to reduce skin pigmentation and give a protective and emollient effect against melanin patients with a genetic susceptibility to asthma and allergic rhinitis have been seen to benefit from the administration of licorice gel for the treatment of atopic dermatitis. To lessen facial itching, a mixture of liquorice gel is applied to the skin. licorice extract can reduce skin pigmentation in black mollyfish by blocking tyrosine owing to melanin dispersing from its site and remove the scars in skin .they also have antiviral properties [36-37].

Fig. 6 - Liquorice

Uses

- Liquorice help reduce redness ,swelling and itching .
- Soothing skin condition
- Anti inflammatory effect
- Immunomodulatory effect
- It antiviral and antibacterial properties help the body fight off various infection.

Tulsi

Since ancient times, Tulsi is perhaps a prominent example of the holistic lifestyle approaches to health in Ayurveda in tulsi which is characterized by a pungent and bitter taste and id traditionally believed to act at deeper tissue level , dry body tissue secretions as well as normalize kapha and vata. Daily consumption of tulsi is considered to possesess diseases preventive properties , foster holistic well being , support longevity , and aid in adaption to everydays stress. tulsi is associated with improved complexion, refined voice quality, enhance endurance, mental acuity and emotional stability.[38-39] beyond its general health benefits tulsi is traditionally utilized in the treatment of respiratory, GIT, dermatological ,cardiovascular and genitourinary disorder along with febrile illnesses ,parasitic infection and venomous bites.[40-41]. Tulsi is effective against a wide range of illnesses in both people and animals, making it a useful tool for sanitation of hands due to its broad-spectrum antibacterial action. The everyday application of Tulsi is evidence of Ayurveda's wisdom and supplies a case study of how traditional knowledge can take on today's challenges[42-59]

Uses

- Tulsi promotes skin brightness.
- Tulsi is useful for reducing pores on the skin.
- All types of skin allergies and infections can be treated with tulsi.
- Reduces acne and encourages aging skin health
- Boost immunity

Fig. – 7 Tulsi

General Ingredients

Glycerin

Glycerin, also known as glycerol, is a thick, colorless, odorless, and sweet-tasting liquid derived from natural fats and oils. It is frequently used as a humectant in pharmaceutical and cosmetic treatments to hold onto moisture and maintain moisturized, soft skin.

Liquid Paraffin

Liquid paraffin is an example of an emollient—a material that soothes or softens the skin. It works by preventing water absorption by the epidermis. This lessens dryness by softening and moisturizing the skin. Therapy for dry skin involves the use of liquid paraffin. It relieves eczema, ichthyosis, and older pruritus, among other dry skin diseases.

Stearic Acid

The white, waxy fatty acid known as stearic acid is derived from vegetable or animal fats. As an emulsifying, thickening, and stabilizing agent in creams and lotions, it is frequently utilized in medicinal and cosmetic compositions.

Soft Paraffin

Petroleum is used to make soft paraffin, a semi-solid white or yellow petroleum jelly. It is frequently used as an emollient and protective foundation in pharmaceutical and cosmetic products to hydrate and shield the skin.

Methyl Paraben

As an antimicrobial preservative, methyl paraben is most commonly found in cosmetic products. Methyl paraben is one of the preservatives used to stop the sgrowth of pathogens and undesirable chemical changes in the body.

Vitamin E

Vitamin E is a naturally occurring antioxidant and fat-soluble vitamin that helps shield skin cells from environmental and free radical damage.

Water

in all cream processes, this is the most crucial and often utilized raw element. These are the simplest and most accessible. Water can also be utilized to create emulsions; the amount of water used in the formulation determines whether the emulsion is referred to as oil-in-water or water-in-oil, based on the proportions of water and oil phase employed.

Formulation of Herbal Cream

S.no.	Ingredients	Quantity	Use
1	Liquorice	2ml	Anti inflammatory, soothing effect, healing wounds
2	Neem	2ml	Antibacterial ,relieves itching and skin irritation
3	Tulsi	1ml	Reduce skin infection and itching
4	Aloe vera	4ml	Wound healing, moisturizes the skin and prevent dryness
6	Glycerin	2ml	Humectant , softness the skin
7	Liquid paraffin	3ml	Lubricant emollient
8	Stearic acid	1gm	Stabilizers , improve texture
9	Soft paraffin	2gm	Emollient, protects skin from irritation
10	Methyl paraben	1gm	preservatives
11	Vitamin E	1ml	Antioxidant ,helps repair damaged skin
12	Distilled water	10ml	solvent

Procedure

In a borosilicate glass container, heat the liquid paraffin, soft paraffin, and stearic acid. Then, record the temperature. (Level of Oil). Glycerine and methyl paraben should be dissolved in distilled water in a separate container. To make a clear solution, heat the mixture to 70 to 75°C. (Level of water). The water level should be gradually mixed with the hot oil level. Next, add the necessary quantity of aloe vera, liquorice, neem, and tulsi extracts. Add vitamin E after that. Once the smooth cream has cooled, transfer the mixture into an airtight container.

Evaluation Test

S. no.	Evaluation Parameter	Observation
1	Color	Light green
2	Odor	Pleasant odor
3	Texture	Smooth
4	Washability	Easily washable
5	Viscosity	Suitable viscosity for topical application
6	PH	5.8 - 6.2

7	Greasiness	Non greasy
8	Irritancy effect	No irritation
9	State	Semi solid
10	Stability study	No changes in color and odor
11	Spread abilities	Good spreadabilty

Conclusion

The Indian medical system's foundations are firmly anchored in the practice of using herbs for therapeutic purposes. People all over the world rely heavily on plant based therapeutic system for primary health care services alongside the development of science, technology, and modern medicine. Because of there widespread use in nature, reduced cost, negligible adverse effects, and high appeal, herbal phytomedicine are becoming more reliable every day. Nature provide essential medications for human survival across the globe in an effort to meet the demands of a growing population and deteriorating health condition. herbal medicines offer direct therapeutic alternatives for several skin ailments . Numerous studies on herbal extracts have revealed their therapeutic efficacy against various skin condition, such as inflammation , burning sensation ,scars , irritation caused by chicken pox and other skin disorders such as inflammatory skin disease (eczema ,acne, psoriasis) , infection , pigmentation disorder, and cancer – related skin conditions and minor cut and wounds, I summarized the generalized effects of herbal origin that are useful in treating various skin conditions. These include Tulsi, Neem, Aloe, Liquorice . The success of many natural medicines encourages encourages extensive research for the development of newer, more effective, and safer herbal formulation. the herbal industry, working in collaboration with the pharmaceutical industry, play a crucial role in improving therapeutic care. A advantages of herbal phytomedicines continue to inspire scientists to explore innovative lead compounds and advanced methods for preventing skin infection and accelerating drug discovery

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