



EXPLORING THE ANTIBACTERIAL IMPACTS OF DATURA METEL AND SWERTIA CHIRAYITA FOR ECZEMA TREATMENT

Microbiology

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ABSTRACT

Background: Eczema, immunological dysfunction and hereditary factors are involved in this chronic inflammatory skin disease, and environmental triggers like irritants, allergens, and stress. It causes itchy, dry, and inflamed skin, affecting all ages. **Objective:** The purpose of this study is to investigate the long-term effectiveness of Datura metal and Swertia chirayita in managing eczema symptoms and preventing flare-ups in chronic eczema patients. **Materials & Methods:** Phytochemical analysis was conducted on crude extracts of Datura leaf and Chirayita root, testing for flavonoids, alkaloids, and phenols. Antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus*, and *Candida albicans* was evaluated. **Result:** The antimicrobial activity of Chirayita root and Datura leaf extracts significantly inhibited *Escherichia coli*, *Staphylococcus aureus*, and *Candida albicans*, indicating their potential to reduce eczema-related infections. **Conclusion:** Chirayita root and Datura leaf extracts effectively inhibit eczema-associated pathogens, demonstrating their therapeutic potential and supporting their traditional use as natural remedies for managing eczema symptoms.

KEYWORDS

Eczema, Antibacterial, Datura metal, Swertia chirayita, flavonoids, alkaloids.

INTRODUCTION

Atopic dermatitis, another name for eczema, is a chronic inflammatory skin disease that caused by dry, irritated, and itchy skin. Although it usually first manifests in early childhood, this non-contagious illness can impact individuals at any age [1-2]. Originating from the Greek word "ekzein," which means "to boil over," the word "eczema" refers to the red, swollen skin patches that are frequently observed in people with this disorder. Although atopic dermatitis is the most prevalent type of eczema, additional forms include nummular eczema, contact dermatitis, seborrhea dermatitis, and dyshidrotic eczema [3-4]. It is a complex illness impacted by a number of immune system, environmental, and hereditary variables. A mutation in the filaggrin gene is one of the main genetic variables linked to eczema, as it is essential for preserving the skin's barrier function [5-6]. The skin becomes more vulnerable to dryness, irritation, and infection when the skin barrier is weakened, which facilitates the penetration of allergens, germs, and other irritants. This causes the inflammatory reactions that show up as signs of eczema [7-8]. A major contributing factor to eczema is immune system malfunction as well. Chronic inflammation is caused by the immune system of eczema sufferers overreacting to innocuous stimuli. This is why people with eczema often experience flare-ups when exposed to allergens, irritants, or stress [8-9]. Environmental factors are equally important. Common eczema triggers include: Irritants such as soaps, detergents, and synthetic fabrics. Allergens like pollen, pet dander, and dust mites. Weather conditions, particularly extreme cold or heat and dry air. Stress and emotional factors can also exacerbate symptoms, as stress triggers a release of inflammatory substances in the body [10-11].

Through ancient times, people from many civilizations have utilized herbal plants for their medicinal properties and play crucial role in traditional and modern medicine. These plants contain bioactive compounds such as alkaloids, flavonoids, and terpenoids, which have therapeutic effects, including anti-inflammatory, antioxidant, and antimicrobial properties [12-13]. Herbal medicine systems like Ayurveda, Traditional Chinese Medicine (TCM), and Unani have long relied on these plants to treat diseases, promote health, and prevent illnesses [14-15]. Eczema common inflammatory skin condition characterized by itching, redness, and swelling [16]. While conventional treatments often involve corticosteroids and moisturizers, remedies offer natural alternatives. Two potent medicinal plants, **Datura (Datura metel)** and **Chirayita (Swertia chirayita)**, have shown promise in the treatment of eczema due to their anti-inflammatory and antimicrobial properties [17-18]. **Datura metel**, known analgesic and anti-inflammatory effects, has been used traditionally for various skin disorders. Its bioactive compounds, such as tropane alkaloids, help reduce inflammation and soothe irritated

skin, making it beneficial in eczema management [19]. **Chirayita (Swertia chirayita)**, widely recognized in Ayurvedic and Unani medicine, possesses strong anti-inflammatory and detoxifying properties [20]. Its bitter compounds, such as swertiamarin, aid in purifying the blood and reducing skin inflammation, which can alleviate eczema symptoms [21-22].

The purpose of this study is to investigate the long-term effectiveness of Datura metal and Chirayita in managing eczema symptoms and preventing flare-ups in chronic eczema patients.

MATERIALS AND METHODS

Study Design:

This research was conducted in Nims University Rajasthan, Jaipur. In this 18 albino rats weighting 150-200g were obtained from small breeding animal house and we divided them into 3 groups and kept 6 animals in each group and this was treated for 30 days and they were given 12 hours dark/light cycle, provided with water and normal food pellet. Continuous monitoring will be conducted in conformity with the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) and the Institutional Animal Ethics Committee (IAEC).

Plant Collection:

Datura leaf and chirayita root is obtained from Nahargarh Sanctuary, Jaipur and is located from Nims University approximately 10 km away.

Preparation Of Plant Extract

Datura leaf and chirayita root were washed and dried separately at room temperature and then grind them to make powder. And both separately prepared ethanolic extract by applying 150 g of powder on a muslin cloth and heating it with 300 ml ethanol at 47°C in a soxhlet apparatus. Then the solid particles of the extract were removed using filter paper and its ethanol was reduced using a rotary evaporator and its crude extract was obtained.

Eczema Induced In Rats:

The rats hair was removed with an electric razor and formaldehyde was injected into subcutaneous tissues to create eczema. Then we saw symptoms of eczema on their skin within 3 days.

Experimental Protocol:

Group	Exposure	Treatment	No. of Rats
Control Group	Normal	Normal	6
Formaldehyde-	Formaldehyde	None	6

Induced Group			
Treatment group	Formaldehyde	(50+50) Dhatura leaf + Chirayita root	6

Weight Measurement In Rats

The weight of the experimental rats was measured using an electronic sensitive analytical balance for control group and treatment group.

Antimicrobial Activity of Dhatura Leaf and Chirayita Root

The leaves of Datura metel and the roots of Swertia chirayita have shown notable antimicrobial properties. Datura metel contains alkaloids, flavonoids, and phenols, which are known for their antimicrobial effects. Studies indicate that Datura leaf extracts can inhibit the growth of various pathogens, including Staphylococcus aureus, Escherichia coli, and Candida albicans. These effects are attributed to the presence of bioactive compounds that disrupt bacterial cell walls and inhibit microbial metabolism. Swertia chirayita roots are rich in Flavonoids, alkaloids, and other Phytochemical, which possess strong antimicrobial activity. The root extracts have been found effective against gram-positive and gram-negative bacteria, as well as fungal strains. Their efficacy in treating infections further supports their use in traditional medicine for wound healing and as a remedy for gastrointestinal and skin-related infections.

Phytochemical Analysis In Datura Leaf And Chirayita Root

Phytochemical analysis of crude extract of Datura leaf and chirayita root was done and flavonoids, alkaloids and phenols were tested in which the amount of metabolites was found ,in which chirayita contained flavonoids 44.80±5.75, alkaloids 41.89±1.38, phenol 45.59±1.79and the amount of flavonoids 36.51±0.007 alkaloids 39.63±0.005 and phenol 43.52±0.003 of Dhatura leaf is shown in table 1.

Antimicrobial activity

Gram positive and gram negative bacteria detected in eczema samples and when its crude extract was tested for antimicrobial activity with chirayita root and Datura leaf growth inhibition of Escherichia coli (gram negative) 25.14±0.69 or 36.51±0.007 ,Staphylococcus aureus (gram positive) 23.15±0.72 or20.23±0.07 and Candida albicans (gram positive) 21.6±05.15 or 18.10±0.003 was found. With the help of these plants the eczema has been mitigated. from the experimental result represented in table 2.

Table 1 Phytochemical analysis for Quantitative in ethanol extract of Datura leaf and chirayita root:

Phytochemical analysis	Amount of metabolites in chirayita roots	Amount of metabolites in Datura leaf
Flavonoids	44.80±5.75	36.51±0.007
Alkaloids	41.89±1.38	39.63±0.005
Phenols	45.59±1.79	43.52±0.003

Table 2 Antimicrobial activities of crude extract of Datura leaf and chirayita root

pathogens	Gram positive or Negative	Concentration of plant extract	Growth inhibition of Chirayita root	Growth inhibition of Datura leaf
Escherichia coli	Gram negative	100 g	25.14±0.69	17.46±0.49
Staphylococcus aureus	Gram positive	100g	23.15±0.72	20.23±0.07
Candida albicans	Gram positive	100g	21.6±05.15	18.10±0.003

RESULTS AND DISCUSSION

The antimicrobial activity of crude extracts from Chirayita root and Datura leaf was tested against bacteria found in eczema samples. The extracts showed significant inhibition of Escherichia coli (Gram-negative), Staphylococcus aureus (Gram-positive), and Candida albicans (Gram-positive). These pathogens are commonly associated with eczema infections. The experimental results demonstrated that the use of these plant extracts effectively reduced the growth of these microorganisms, suggesting their potential role in mitigating eczema symptoms and infections.

CONCLUSION

In conclusion, the crude extracts from Chirayita root and Datura leaf demonstrated strong antimicrobial activity against Escherichia coli, Staphylococcus aureus, and Candida albicans, which are commonly associated with eczema infections. The significant inhibition of these

microorganisms highlights the therapeutic potential of these plants in reducing microbial growth, thereby helping to alleviate eczema symptoms. This study supports the traditional use of Chirayita and Datura in treating skin conditions and suggests their promising role as natural remedies for eczema management.

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