INVESTIGATING THE ANTI-ACNE PROPERTIES OF LAWN PLANTS
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ABSTRACT
The human skin encompasses a vast variety of microorganisms which construct the structure of skin microflora. Bacteria and yeasts may be the pioneers of the human skin normal flora. Propionibacterium acnes is the major skin bacterium that cause the formation of acne. In the present study, Propionibacterium acnes was isolated from acne affected facial skin using sterile cotton swab. The anti-acne activity of aqueous and methanolic leaf extract of Psidium guajava, Ixoracoccinea and Moringa oleifera were investigated. Phytochemical screening of these extracts revealed the presence of saponins, phenols, tannins and terpenoids. The outcome of the study suggested that Psidium guajava, Ixoracoccinea and Moringa oleifera plant extracts could be possible to use as the natural anti-acne formulations.

Keywords: P.acnes, Medicinal Plants, Acne ,Skin infections

I. INTRODUCTION
Acne vulgaris is a chronic inflammatory disorder in adolescents characterized by papules, cyst, scars, primarily on face and neck[1]. The causative organisms of this disorder is Propionibacterium acnes (P. acne) and Staphylococcus epidermidis. The major causes of the disorder in adolescents is the over production of sebum, increase in androgen levels in both girl and boy during puberty, pregnancy related hormonal stress, skin irritation and even heredity. Propionibacterium species are common inhabitants of the skin. Propionibacterium acne is the pleomorphic, Grampositive, non-spore forming anaerobic bacillus. Propionibacterium acnes thrive on the oily surfaces of the skin and hair follicles[2]. These bacteria contribute to the development of acne as they proliferate due to excess oil production and clogged pores. Propionibacterium acnes bacteria use the sebum produced by sebaceous glands as fuel for growth[3]. Sebum is a lipid consisting of fats, cholesterol, and a mixture of other lipid substances. Sebum is necessary for proper skin health, as it moisturizes and protects hair and skin. Abnormal production levels of sebum contribute to acne as it clogs pores, leads to excess growth of Propionibacterium acnes bacteria, thereby causing Acne vulgaris [1].

The medications commonly available for acne are antibiotics like Erythromycin, Clindamycin that have several adverse effects like erythema, photosensitivity, allergic dermatitis, excessive skin irritation etc [4]. Hence natural remedies are been used for controlling acne. In the present study, the anti-acne activity of aqueous and methanolic leaf extract of Psidium guajava, Ixoracoccinea and Moringa oleifera were investigated.

II. MATERIALS AND METHODS
2.1 Collection of plants and Preparation of Leaf extracts
The Three plants were collected from nearby localities. The leaves of Psidium guajava, Ixoracoccinea and Moringa oleifera were shade dried for about 10 days. The dried leaves were then ground into fine powder. In order to obtain aqueous extracts, 1 gram each of the powders were added to 10ml distilled water in separate bottles and was kept for overnight incubation. Similarly for obtaining methanolic extracts, 1 gram each of the powders were mixed with 10ml methanol in each bottle and was kept for overnight incubation. After 24hr the mixture were centrifuged and the supernatant was collected and stored as leaf extracts.
2.2 Isolation & Identification of P.acnes from Facial Swab
The skin inhabiting bacteria was isolated from the acne infected face using a sterile swab dipped in the sterile distilled water. This was then swabbed on a prepared Nutrient Agar plate and further kept in the incubator for overnight growth. After the Quadrant streaking method, pure isolate of the bacterium was obtained. The identification of the bacterium was done using the method explained by Cauich-Sanchez et al.,2001 [5].

2.3 Phytochemical Screening of the Plant Extracts
The phytochemical screening of both the leaf extracts was performed according to the standard procedures described by Sofowora,Trease and Evans [6,7]. The tests for phenols, tannins, saponins, flavonoids, alkaloids, reducing sugar, were conducted.

2.4 Anti-acne activity of the leaf extracts
The identified skin pathogen was inoculated in nutrient broth and incubated overnight. Petri plates containing Muller Hinton Agar were swabbed with the identified bacteria using sterile swab. Wells were made in each plate using sterile well-borer. 100µL & 200µL of both methanolic and aqueous extracts of each plant, a positive control and a negative control were added to the wells made in the petri plates. These plates were then kept in the bacteriological incubator for 24 hours. After 24hrs the zone of inhibition in the plates were measured.

3. RESULTS
3.1 Isolation and Identification of Skin Inhabiting Bacteria
The pure isolate, after Gram Staining, was found to be a rod-shaped, non-sporulating, gram positive bacterium (Figure 1). The indole test, a biochemical test performed on bacterial species to determine the ability of the organism to covert amino acid tryptophan into indole, was positive for the isolate. Hence, as per the methodology, the isolate was identified as Propionibacterium acnes.

![Figure 1. Microscopic View of P.acnes after Gram Staining](image)

3.2 Phytochemical Screening of the Leaf Extracts
The phytochemical screening of the aqueous and methanolic leaf extracts revealed the presence of the phenols, tannins, saponins, etc (Table 1).

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Extract</th>
<th>Phenols &amp; Tannins</th>
<th>Flavonoids</th>
<th>Saponins</th>
<th>Alkaloids</th>
<th>Glycosides</th>
<th>Reducing Sugar</th>
<th>Terpenoids</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aq.extracts of P.guajava</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Aq. Extract of I.coccinea</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Aq extract of I.coccinea</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
The anti-acne activity of the three plants was experimentally analyzed by the Well diffusion Method. The results reveal that the methanolic extract of *P. guajava* acts as a better anti-acne agent which is preceded by the methanolic extracts of *M. oleifera* and *I. coccinea*. The study also reveals that the methanolic extracts are superior than aqueous extracts. In addition to the plant extracts, the anti-acne activity of a known antibiotic was also performed. The Zone of Inhibition was found to be 23 mm when the well was loaded with 10μL of the antibiotic (Positive control). The detailed results are given in Table 2.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Plant Extract</th>
<th>Zone of Inhibition on Adding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>100μl Sample</td>
</tr>
<tr>
<td>1</td>
<td>Aq. Extract of <em>P. guajava</em></td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Methanolic extract of <em>P. guajava</em></td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Aq. Extract of <em>I. coccinea</em></td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Methanolic extract of <em>I. coccinea</em></td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>Aq. extract of <em>M. oleifera</em></td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Methanolic Extract of <em>M. oleifera</em></td>
<td>6</td>
</tr>
</tbody>
</table>

4. DISCUSSION

The human skin is the outer covering of the body and is the largest organ of the integumentary system[8]. Large number of microorganisms resides on the skin (skin flora). Majority of these microbes are non-pathogenic permanent resident or temporary residents and rest of the microbes are pathogenic in nature[8]. Many skin pathogens can be typically found living on the skin as commensals but microbial imbalance, host genetic variation and immune system status may drive the transition from commensals to pathogen.

In our study, three locally available plants, *Peridium guajava* (*Guava*, leaf), *Ixoracoccinea* (*thechi*, leaf) and *Moringa oleifera* (*drumstick*, leaf) were used. These three leaf extracts showed high antimicrobial activity against gram positive, *Propionibacterium acnes*. The secondary metabolites present in the plant extracts were responsible for the antimicrobial activity. In our study phytochemical screening indicated the presence of secondary metabolites such as phenols, tannins, saponins and terpenoids.

Today, Humans are using chemical skin care products like cream, lotions and tablets for the treatment of acnes, rashes and other microbial infections. Impact of using chemical products is very high. Chemical products have harmful side effects on our skin and body such as headaches, acnes, skin cancer and skin discoloration [9]. Therefore, the best way to avoid the side effects of chemical skin care products is by reducing the use and switching to natural products. Medicinal plants like *Psidium guajava*, *Ixoracoccinea* and *Moringa oleifera* etc can be used as a natural skin care products without any harmful side effects. The benefits of using these plants as natural skin
care products are earth-friendly avoid irritation, no strange side effects, avoid skin allergies and premature ageing.

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REFERENCES