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Floral Fusion for Skin Health: Investigating the Antimicrobial Activity of *Tagetes erecta* and *Caesalpinia pulcherrima* in Herbal Topical Formulation

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ABSTRACT :

Herbal word is symbol of safety in contrast to synthetic one which has no adverse effects on human health. Even in areas where modern medicine is available, the interest on herbal medicines and their utilization have been increasing rapidly in recent years. Herbal medicine refers to the use of any plants, seeds, berries, roots, leaves, bark or flowers for medicinal purposes. Along with other dosage forms, herbal drugs are also formulated in the form of ointment. An ointment is a viscous semisolid preparation used topically on a variety of body surfaces. The objective of the study was to formulate and evaluate the antimicrobial herbal ointment from the local medicinal plants. The ethanolic extracts of selected plants were taken in different ratio randomly and antimicrobial test of combinations were carried out. The ointment base was prepared and formulation of ointment was done by incorporating the active ingredients in the base by trituration. After the completion of the formulation, quality of the ointment was assessed in terms of its antimicrobial activity, irritancy and spreadability.

Keywords: Herbal ointment, Antimicrobial activity, irritancy, spreadability.

INTRODUCTION

Herbal medicine refers to the use of any plant's seeds, berries, roots, leaves, bark, or flowers for medicinal purposes. Along with other dosage forms, herbal drugs are also formulated in the form of ointment. An ointment is a viscous semisolid preparation used topically on a variety of body surfaces. These include the skin and the mucus membranes of the eye, vagina, anus, and nose. An ointment may or may not be medicated. Medicated ointments contain a medicament dissolved, suspended or emulsified in the base. Ointments are used topically for several purposes. e.g. as protectants, antiseptics, emollients, antipruritic, keratolytics and astringents. Ointment bases are almost always anhydrous and generally contain one or more medicament's in suspension or solution or dispersion.[1]

Medicinal plants play an important role for the management of different microbial infections Medicinal plants must be tested for microbiological contamination and foreign materials to assure quality In third world countries, where contagious diseases are common, it is important to search out and promote plant-derived medicines. These medicines can destroy microbes that cause certain contagious diseases and should be used in conjunction with modern medicines and antibiotics. Plants that are being used in conventional herbal remedies should be investigated for their potential to produce new drugs with antimicrobial properties similar to those of modern medicines. Antimicrobial agents are currently being imported and are limited to those who can afford them, but local medicinal plants can be much more widely available.[2]

Infectious Topical Disorders

1. **Fungal Infections (e.g., Athlete's Foot, Ringworm)**
   - Caused by dermatophytes; characterized by itchy, ring-shaped rashes.
   - Treated with antifungal creams (e.g., clotrimazole, terbinafine).[3]
2. **Bacterial Skin Infections (e.g., Impetigo)**
   - Often caused by *Staphylococcus* or *Streptococcus* bacteria.
   - Treated with topical antibiotics like mupirocin.[3]
3. **Viral Skin Infections (e.g., Herpes Simplex)**
   - Cold sores, genital herpes.
   - Treated with topical antivirals (e.g., acyclovir cream).[3]
4. **Warts**
   - Caused by human papillomavirus (HPV).
   - Treated with salicylic acid, cryotherapy, or immune-modulating creams.[3]

Other Common Topical Conditions

1. ***Seborrheic Dermatitis***
    - Affects scalp and face; causes dandruff and redness.
    - Treated with antifungal shampoos and topical steroids.[3]
2. ***Vitiligo***
    - Loss of skin pigment in patches.
    - Topical treatments include corticosteroids and calcineurin inhibitors.[3]
3. ***Hyperpigmentation Disorders (e.g., Melasma)***
    - Darkened skin patches due to sun exposure, hormones, or inflammation.
    - Treated with hydroquinone, retinoids, or azelaic acid.[4]
4. ***Sunburn***
    - Caused by UV radiation.
    - Treated with soothing topical agents like aloe vera and anti-inflammatories.

TAGETES ERECTA (MARIGOLD)

Tagetes species belonging to family asteraceae, are most common in plant kingdom, which is used in different areas like cosmetic preparation, medicines as well as it is most widely used as ornamentals. Flowers are mainly used for the all these purposes by the extraction process Lutein is one of the major constituents and main pigment of *Tagetes erecta.* It shows different pharmacological activities like anti-bacterial activity, hepatoprotective activity, insecticidal activity, nematicidal activity, wound healing activity, anti oxidant activity, larvicidal activity, sub acute toxicity studies in detail.[5]

Fig:1 ***Tagetes Erecta***

CAESALPINIA PULCHERRIMA (PEACOCK FLOWER)

Caesalpinia pulcherrima is a perennial large shrub or small tree commonly known as Peacock-flower or Pride of Barbados belongs to the family Fabaceae. The antimicrobial activity of aqueous and methanolic extracts of aerial parts of *C. Pulcherrima* was evaluated. It was reported that *C.pulcherrima* can be used in treating diseases caused by the tested organisms. Methanol extract of *Caesalpinia pulcherrima*, was evaluated for its hypolipidemic activity in diet-induced lipidemia in mice.[6]

Fig 2: ***Caesalpinia Pulcherrima***

MATERIALS AND METHOD

Extraction of *Tagetes erecta* (Marigold)

Marigold flower fresh in weight of 3kg were taken, cleaned, air-dried and macerated in ethanol until all were completely immersed, in about 24 hours for 3 days.The extract filtered and concentrated using a rotary vacuum evaporator to obtain a thick extract.[7]

Extraction of *Caesalpinia pulcherrima* (Peacock flower)

Fresh plant materials that were not contaminated by bacteria or fungi were removed from healthy plants. Plant organs were washed to remove dirt and then sliced into small segments, after which they were left to dry naturally at 150-300° C, air-cooled until the plant material were totally dry. The individual plant materials were later milled using a blender or grinding machine to produce dried plant powder. The dried part of the stems, flowers, fruits and leaves were extracted by maceration using 70% ethanol for 24 hours at 150-300° C. The resulting extracts from each part of the plant were separated from the solvent by filtering using No. 1 Whatman paper. The filtrate was then evaporated using reflux method and dried over a water bath. Subsequently, the extract was collected and stored at 4° C before use.[8]

Fig 3: extraction of marigold and peacock flower

METHODS

In this method the constituents of the base were placed together in a melting pan and allowed to melt together at 70°C. After melting, the ingredients were stirred gently maintaining temperature of 70°C for about 5 minutes and then cooled with continuous stirring. Formulation of ointment done by incorporating the ethanolic extract of *Tagetes erecta* and *Caesalpinia pulcherrima* into the various bases by triturating in a ceramic mortar with a pestle to obtain herbal ointment containing extract. The prepared herbal ointments were put in ointment jars, labelled and were stored at room temperature.[9]

CONSTITUENTS	WEIGHT
BEESWAX	0.4gm
WHITE SOFT PARAFFIN	18gm
HARD PARAFFIN	0.6gm
CETYL ALCOHOL	1gm
TAGETES ERECTA	5gm
CAESALPINIA PULCHERRIMA	5gm

EVALUATION OF HERBAL OINTMENT

- **Appearance:** The appearance of the lotion was observed by visual examination.
- **Colour:** The colour of the cream was observed by visual examination.
- **Odor:** The odour of the lotion was tested by smelling
- **pH**: PH of prepared herbal lotion was measured by using both PH paper & digital PH meter
- **Spreadability:**The spreadability was determined by placing excess of sample between two slides which was compressed to uniform thickness by placing a define weight for definite time.the time required to separate the two slides was measured as spreadability.

- **Non-Irritancy:** Prepared herbal ointment was applied to the skin of human being and observed for the effect.
- **Antimicrobial activity:** Required quantity of agar was prepared and micro organism gram positive micro organism (example *Staphylococcus aureus* and *Bacillus subtilis)* and gram negative micro organism (*Pseudomonas aeruginosa* and *Escherichia coli)* was inoculated into it. Then agar solution was poured into the petri plates and allowed to stand for few minutes to get solidified. After solidification, prepared ointment was spreaded into it. Now petri plates are allowed for growth of microorganism for 24 hours. After 24hr zone of inhibition was checked to determine the antimicrobial activity of prepared ointment.

Fig 4 : Staphylococcus aureus

Fig 5: *Bacillus subtilis*

Fig 6: *Pseudomonas aeruginosa*

Fig 7: ***Escherichia coli***

Evaluation results of formulated herbal ointment

Parameters	**Herbal ointment**
Appearance	Ointment type
Colour	Greenish.
Odor	Aromatic.
pH	7
Irritation Test	Non-irritable & non allergic on the skin
Spreadability	Easily spreadable.

Evaluation results of antimicrobial study

Micro-organisms	**Zone of inhibition**
Staphylococcus aureus	11mm
Bacillus subtilis	40mm
Pseudomonas aeruginosa	3mm
Escherichia coli	4mm

CONCLUSION :

Field existences of antibiotic resistant pathogenic bacteria are increasing in recent years. Pharmaceutical companies are now looking for alternatives. Plants have been a rich source of medicines because it is believed that plant based drugs cause less or no side effect and affect wide range of antibiotic resistant microorganisms. The results of this study showed that ointment containing ethanolic extracts of *Tagetes erecta* and *Caesalpinia pulcherrima* effectively inhibited the growth of bacteria, mainly gram positive microorganisms. The results of different evaluation test of ointment showed that it could be used topically in order to protect skin against damage caused by these pathogens.

The results revealed that the crude extracts contain certain constituents like alkaloids, tannins, flavonoids and triterpenes which could make the plant useful in treating different ailments and have potential to provide useful drug for human use. The present study exhibited the antibacterial effect of ointment containing extracts of *Tagetes erecta* and *Caesalpinia pulcherrima.* The inhibitory effect of the ointment justified the medicinal use. Hence, it is apparent that this ointment has been found to possess effective antibacterial effect against a wide range of microorganisms.

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