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Development and Evaluation of Antibacterial Polyherbal Topical Gel

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pharmaceuticals



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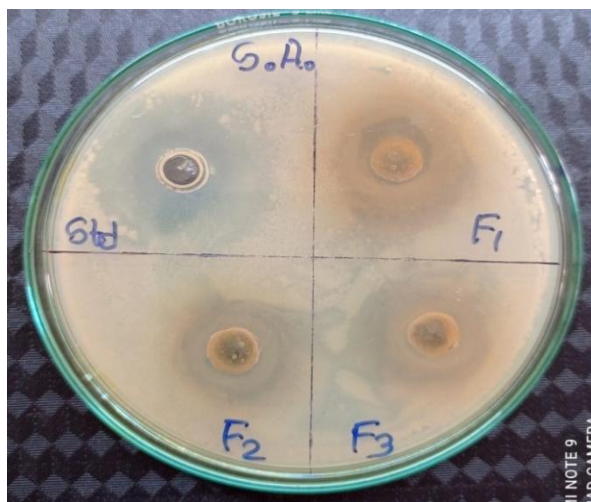
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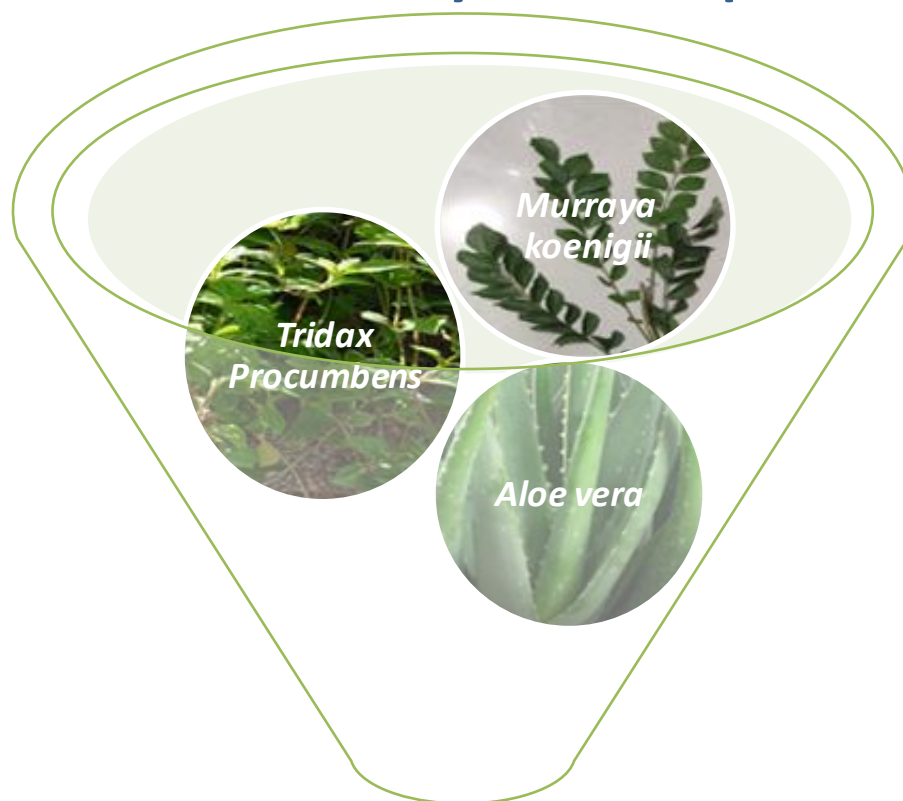


“Development and Evaluation of Antibacterial Polyherbal Topical Gel”

Graphical Abstract:



Antibacterial activity



Topical Gel

Abstract:

There is tremendous expansion in use of traditional medicines worldwide. About three quarters of the world population relies on plants and plant extracts for health care. The major challenges in acceptance of herbal medicines are quality, safety and scientific evidence in relation to their health claims. The topical gel formulations are more preferred due to various advantages such as easy to administer, rapid in action, less greasy and cost effective. Thus the present work focus on preparation of polyherbal gels using varied proportions of traditionally reported plants such as essential oil of *Murraya koenigii*, gel of *Aloe vera*, hydroalcoholic extract of leaves of *Tridax Procumbens*. The prepared polyherbal gels evaluated for their antibacterial activity using agar cup method. The more effective antibacterial polyherbal gel evaluated for physical parameters such as pH, homogeneity, viscosity, extrudability, spreadability, stability. Polyherbal gel formulations F1, F2 and F3 showed antibacterial activity against *Staphylococcus aureus*, *Bacillus subtilis* and *Escherichia coli*. Polyherbal gel F3 showed 20.33 ± 0.88 mm zone of inhibition while standard marketed formulations (Betadine ointment) showed 27.33 ± 0.88 mm zone of inhibition against *Staphylococcus aureus*. Polyherbal gel F3 showed significant antibacterial activity compare to standard marketed formulation. The prepared polyherbal gel F3 has good homogeneity, spreadability, extrudability, stability without any irritation effect on skin.

Keywords: polyherbal gel; antibacterial activity, *Murraya koenigii*; *Aloe vera*; *Tridax Procumbens*

Introduction:

- Polyherbal therapy has been used in traditional system of medicine such as Ayurved, Chinese and Unani for thousands of years. Scientific evidence of their therapeutic benefits is mostly lacking for their acceptance in modern science. Many chronic disease managed by them due to synergistic effect and less side effect of polyherbal formulation.
- Present study focus on preparation of polyherbal gel to treat bacterial infection. Polyherbal topical gel was prepared using varied proportions of traditionally reported plants such as essential oil of *Murraya koenigii*, gel of *Aloe vera* and hydroalcoholic extract of leaves of *Tridax Procumbens*.

- *Murraya koenigii*, commonly known as curry leaf belonging to Family Rutaceae. The essential oil of *M. koenigii* leaves is reported to possess antioxidant, antibacterial, antifungal, larvicidal, anticarcinogenic, hypoglycemic, anti-lipid peroxidative, hypolipidemic and antihypertensive activity.¹
- *Aloe vera* (*Aloe barbadensis* miller) is a plant belongs to the family of Liliaceae. Many studies report the effective use of this plant when applied topically for the treatment of burns, sunburns, inflammatory skin disorders and wounds.²
- *Tridax Procumbens* has anti inflammatory, hepatoprotective, wound healing, immunomodulatory, antimicrobial, hypotensive properties as per reported pharmacological studies.³

Materials and Method:

- **Identification, collection and Preparation of plant material:**
 - Essential oil from leaves *Murraya koenigii*
 - Gel of *Aloe vera*
 - Hydroalcoholic extract(70%) prepared using leaves of *Tridax Procumbens*

- **Preparation of polyherbal gel:**

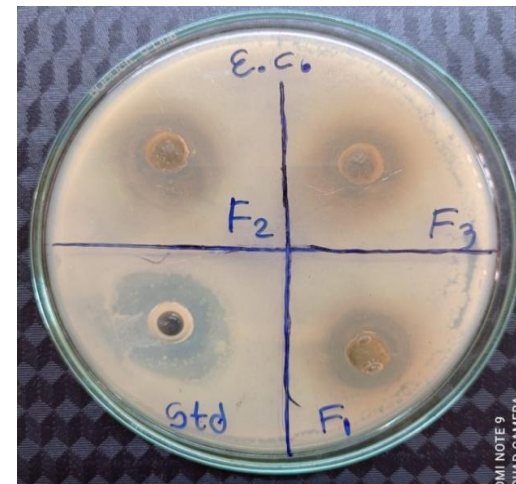
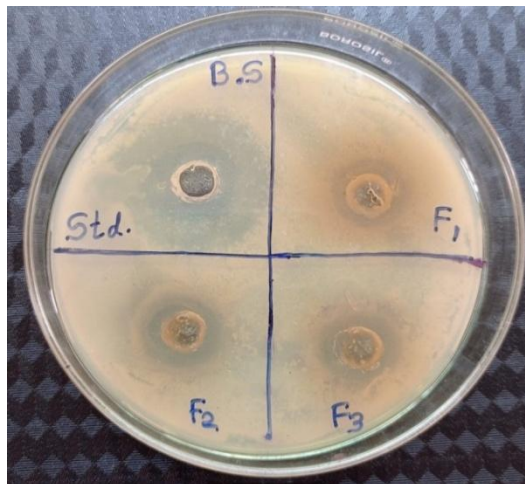
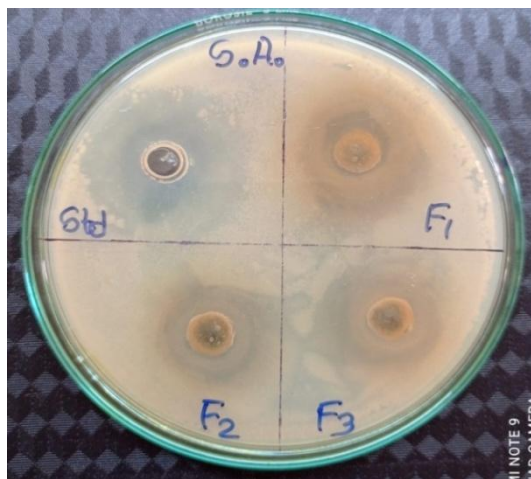
- Polyherbal gel was prepared using carbopol-940 and Triethanolamine with following quantities of prepared plant material.

| Ingredients | Polyherbal Gel-F1 (100 g) | Polyherbal Gel-F2 (100 g) | Polyherbal Gel-F3 (100 g) |
|---|------------------------------|------------------------------|------------------------------|
| Essential oil of <i>M. koenigii</i> | 2.5ml | 2.5ml | 2.5ml |
| <i>Gel of Aloe vera</i> | 0.5 g | 1 g | 1 g |
| Hydroalcoholic extract of <i>T. Procumbens</i> | 1 g | 0.5 g | 1 g |

- **Antibacterial study of Polyherbal gel-F1, F2 and F3 using agar cup method⁴ on bacterial strains:**
 - *Staphylococcus aureus*
 - *Bacillus subtilis*
 - *Escherichia coli*
- **Evaluation of Polyherbal Topical Gel:**
 - Polyherbal gel having good antibacterial activity was subjected to physical evaluation⁵⁻⁶ such as
 - Appearance
 - Homogeneity
 - pH
 - Viscosity
 - Spreadability
 - Extrudability test
 - Stability Studies (as per ICH guidelines for the period of three months)

Results and Discussion:

Figure1: Results of Antibacterial study of Polyherbal gel-F1, F2 and F3:



S.A.-*Staphylococcus aureus*

B.S.-*Bacillus subtilis*

E.C.-*Escherichia coli*

Std.- Standard marketed formulations (Betadine ointment)

F1- Polyherbal gel-F1

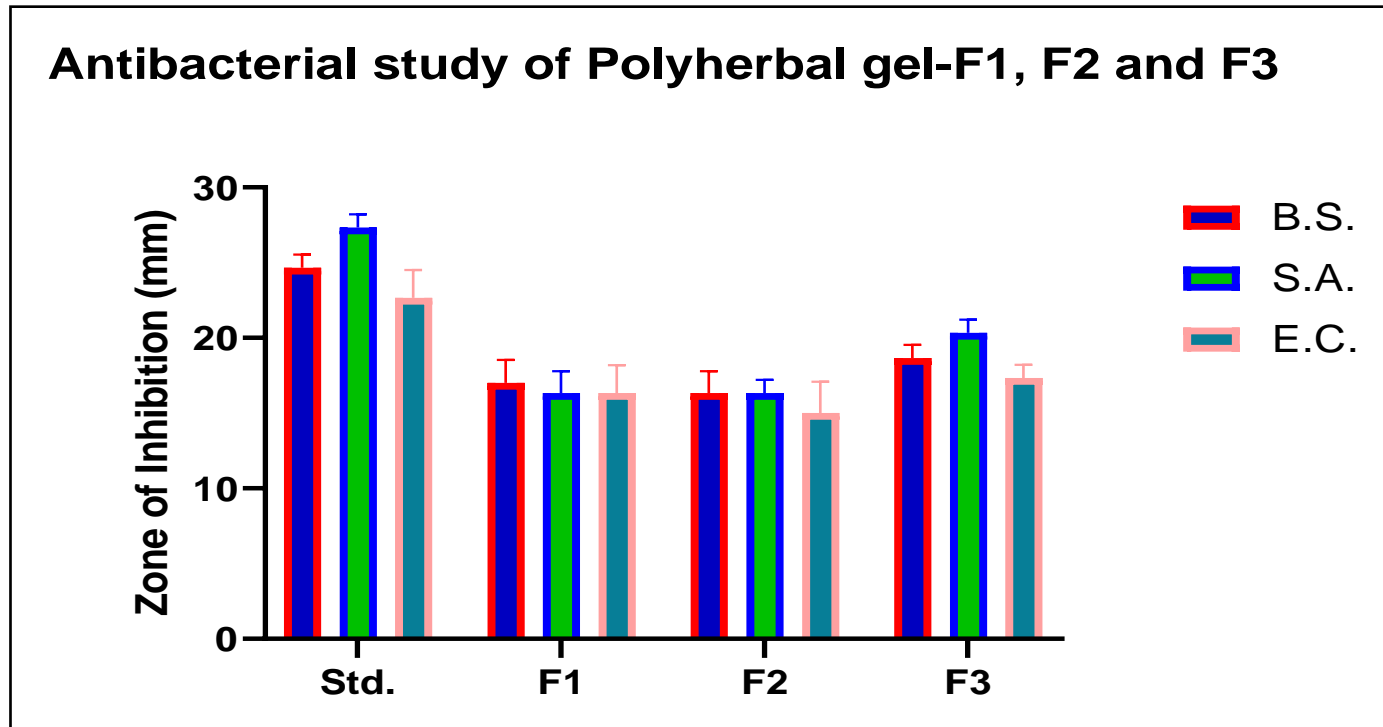
F2- Polyherbal gel-F2

F3- Polyherbal gel-F3

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Figure 2: Results of Zone of inhibition in agar cup method for antibacterial study of Polyherbal gel-F1, F2 and F3:



Values are expressed as Mean \pm SEM, n = 3

B.S.-*Bacillus subtilis*; S.A.-*Staphylococcus aureus*; E.C.-*Escherichia coli*

- Polyherbal gel F3 showed 20.33 \pm 0.88 mm zone of inhibition while standard marketed formulations (Betadine ointment) showed 27.33 \pm 0.88 mm zone of inhibition against *Staphylococcus aureus*. Polyherbal gel F3 showed significant antibacterial activity compare to standard marketed formulation (Betadine ointment) as shown in Figure 2.

Table 1: Results of Evaluation Parameters of Polyherbal gel-F3 :

| Sr. No. | Evaluation parameters | Results |
|---------|-----------------------|---|
| 1 | Appearance | Greenish Brown |
| 2 | Homogeneity | Good |
| 3 | pH | 6.50±0.02 |
| 4 | Viscosity | 2988.31±1.165 cps |
| 5 | Spreadability | 40.52±3.612 gm cm/second |
| 6 | Extrudability | 522.35±1.226 gm |
| 7 | Stability Studies | Good stability (stability study for appearance, pH and spreadability) |

Values are expressed as Mean ± SEM, n = 3

Conclusions:

- Polyherbal gel F3 showed significant antibacterial activity.
- Polyherbal gel F3 showed acceptable physical properties so it is compatible with the skin and having good stability.
- Therefore this formulation may be use to treat various skin infections topically.

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