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"FORMULATION AND EVALUATION OF ANTI MIRCOBIAL & HEALING POTENTIAL POLYHERBAL GEL USING TRIDAX PROCUMBENS AND LAVENDER OIL"

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Abstract: Herbal medicine has become an item of global importance both medicinal and economical. Although usage of these herbal medicines has increased, their quality, safety and efficiency are serious concerns in industrialized and developing countries. Herbal remedies are getting increasing patient compliance as they are devoid of typical side effects of allopathic medicines. The present research has been undertaken with the aim to formulate and evaluate the herbal gel containing Tridax procumbens leaf extract. The gel formulation was designed by using Carbapol 934, Tridax procumbens leaf extract, propylene glycol, methyl paraben, propyl paraben and required amount of distilled water. The skin pH was maintained by drop wise addition of Tri-ethanolamine. The physicochemical parameters of formulations (pH, spreadability, viscosity etc.) were determined. Herbal medications are considered safer than allopathic medicines as allopathic medicines are associated with the side effects. One of the methods for its survival is preparation of extract and their formulations for better absorption and penetration of the active moiety into the systemic circulation.

Keywords: Tridax procumbens, Lavender oil

1. INTRODUCTION

❖ [1.1] SKIN

The skin is the largest organ of the body, accounting for about 15% of the total adult body weight. It performs many vital functions, including protection against external physical, chemical, and biologic assailants, as well as prevention of excess water loss from the body and a role in thermoregulation. The skin is continuous, with the mucous membranes lining the body's surface.

Skin has mesoderm cells, pigmentation, such as melanin provided by melanocytes, which absorb some of the

potentially dangerous ultraviolet radiation (UV) in sunlight. It also contains DNA repair enzymes that help reverse UV damage, such that people lacking the genes for these enzymes suffer high rates of skin cancer. One form predominantly produced by UV light, malignant melanoma, is particularly invasive, causing it to spread quickly, and can often be deadly. Human skin pigmentation varies among populations in a striking manner. This has led to the classification of people(s) on the basis of skin colour.

The skin is composed of three layers: the epidermis, the dermis, and subcutaneous tissue.

The outer most level, the epidermis, consists of a specific constellation of cells known as keratinocytes, which function to synthesize keratin, a long, threadlike protein with a protective role. The middle layer, the dermis, is fundamentally made up of the fibrillar structural protein known as collagen. The dermis lies on the subcutaneous tissue, or panniculus, which contains small lobes of fat cells known as lipocytes. The thickness of these layers varies considerably, depending on the geographic location on the anatomy of the body. The eyelid, for example, has the thinnest layer of the epidermis, measuring less than 0.1 mm, whereas the palms and soles of the feet have the thickest epidermal layer, measuring approximately 1.5 mm. The dermis is thickest on the back, where it is 30-40 times as thick as the overlying epidermis.

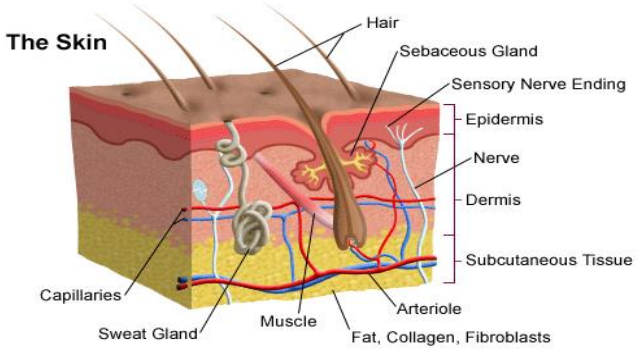

Fig. 1 : Cross-Section of Skin

- **[1.1.1] Epidermis**

1. The epidermis is a stratified, squamous epithelium layer that is composed primarily of two types of cells: keratinocytes and dendritic cells. The keratinocytes differ from the "clear" dendritic cells by possessing intercellular bridges and ample amounts of stainable cytoplasm. The epidermis commonly is divided into four layers according to keratinocyte morphology and position as they differentiate into horny cells, including the basal cell layer (stratum germinativum), the squamous cell layer (stratum spinosum), the granular cell layer (stratum granulosum), and the cornified or horny cell layer (stratum corneum).

2. **Keratinocytes:**

At least 80% of cells in the epidermis are the ectodermally derived keratinocytes. The differentiation process that occurs as the cells migrate from the basal layer to the surface of the skin results in keratinization, a process in which the keratinocyte first passes through a synthetic and then a degradative phase

3. Basal layer:

The basal layer, also known as the stratum germinativum, contains column-shaped keratinocytes that attach to the basement membrane zone with their long axis perpendicular to the dermis. These basal cells form a single layer and adhere to one another as well as to more superficial squamous cells through desmosomal junctions.

Other distinguishing features of the basal cells are their dark-staining oval or elongated nuclei and the presence of melanin pigment transferred from adjoining melanocytes.

The basal layer is the primary location of mitotically active cells in the epidermis that give rise to cells of the outer epidermal layers. However, not all basal cells have the potential to divide.

4. Squamous cell layer:

Overlying the basal cell layer is a layer of the epidermis that is 5-10 cells thick and known as the squamous cell layer or stratum spinosum.The squamous layer is composed of a variety of cells that differ in shape, structure, and subcellular properties depending on their location. Suprabasal spinous cells, for example, are polyhedral in shape and have a rounded nucleus, whereas cells of the upper spinous layers are generally larger in size, become flatter as they are pushed toward the surface of the skin, and contain lamellar granules.

5. Granular layer:

The most superficial layer of the epidermis containing living cells, the granular layer or stratum granulosum, is composed of flattened cells holding abundant keratohyaline granules in their cytoplasm. These cells are responsible for further synthesis and modification of proteins involved in keratinization. The granular layer varies in thickness in proportion to that of the overlying horny cell layer. For example, under thin cornified layer areas, the granular layer may be only 1-3 cell layers in thickness, whereas under the palms of the hands and soles of the feet the granular layer may be 10 times this thickness. A very thin or absent granular layer can lead to extensive parakeratosis in which the nuclei of keratinocytes persist as the cells move into the stratum corneum, resulting in psoriasis.

6. Cornified layer:

Horny cells (corneocytes) of the cornified layer provide mechanical protection to the underlying epidermis and a barrier to prevent water loss and invasion by foreign substances.

The corneocytes, which are rich in protein and low in lipid content, are surrounded by a continuous extracellular lipid matrix. The large, flat, polyhedral-shaped horny cells have lost their nuclei during terminal differentiation and technically are considered to be dead.

The physical and biochemical properties of cells in the cornified layer vary in accordance with position in order to promote desquamation moving outward. For instance, cells in the middle have a much higher capacity for water-binding than the deeper layers because of the high concentration of free amino acids found in the cytoplasm of middle layer cells. The deep cells also are more densely compact and display a greater array of intercellular attachments than the more superficial layers. Desmosomes undergo proteolytic degradation as the cells progress outward, contributing to the shedding of corneocytes during desquamation.

- **[1.1.2] Functions of skin**

1. Protection: an anatomical barrier from pathogens and damage between the internal and external environment in bodily defence; Langerhans cells in the skin are part of the adaptive immune system. Perspiration contains lysozyme that break the bonds within the cell walls of bacteria.

2. Sensation: contains a variety of nerve endings that react to heat and cold, touch, pressure, vibration, and tissue injury; see somatosensory system and haptics.

3. Heat regulation: the skin contains a blood supply far greater than its requirements which allows precise control of energy loss by radiation, convection and conduction. Dilated blood vessels increase perfusion and heat loss, while constricted vessels greatly reduce cutaneous blood flow and conserve heat.

4. Control of evaporation: the skin provides a relatively dry and semi-impermeable barrier to fluid loss. Loss of this function contributes to the massive fluid loss in burns.

5. Aesthetics and communication: others see our skin and can assess our mood, physical state and attractiveness.

6. Storage and synthesis: acts as a storage centre for lipids and water, as well as a means of synthesis of vitamin D by action of UV on certain parts of the skin.

7. Excretion: sweat contains urea, however its concentration is 1/130th that of urine, hence excretion by sweating is at most a secondary function to temperature regulation.

8. Absorption: the cells comprising the outermost 0.25–0.40 mm of the skin are "almost exclusively supplied by external oxygen", although the "contribution to total respiration is negligible".In addition, medicine can be administered through the skin, by ointments or by means of adhesive patch, such as the nicotine patch or iontophoresis. The skin is an important site of transport in many other organisms.

9. Water resistance: The skin acts as a water-resistant barrier so essential nutrients are not washed out of the body

❖ [1.2] GEL

- A gel is a semi-solid that can have properties ranging from soft and weak to hard and tough.[1] Gels are defined as a substantially dilute cross-linked system, which exhibits no flow when in the steady-state.
- A gel has been defined phenomenological as a soft, solid or solid-like material consisting of two or more components, one of which is a liquid, present in substantial quantity.
- By weight, gels are mostly liquid, yet they behave like solids because of a three-dimensional cross-linked network within the liquid. It is the cross linking within the fluid that gives a gel its structure (hardness) and contributes to the adhesive stick (tack). In this way, gels are a dispersion of molecules of a liquid within a

solid medium. The word gel was coined by 19th-century Scottish chemist Thomas Graham by clipping from gelatin .The process of forming a gel is called gelation.

- **[1.2.1] Types:**

1. **Hydrogels:**

A hydrogel is a network of polymer chains that are hydrophilic, sometimes found as a colloidal gel in which water is the dispersion medium. A three-dimensional solid results from the hydrophilic polymer chains being held together by cross-link. Because of the inherent crosslink, the structural integrity of the hydrogel network does not dissolve from the high concentration of water.

Hydrogels are highly absorbent (they can contain over 90% water) natural or synthetic polymeric networks. Hydrogels also possess a degree of flexibility very similar to natural tissue, due to their significant water content. As responsive "smart materials," hydrogels can encapsulate chemical systems which upon stimulation by external factors such as a change of pH may cause specific compounds such as glucose to be liberated to the environment, in most cases by a gel-sol transition to the liquid state. Chemo mechanical polymers are mostly also hydrogels, which upon stimulation change their volume and can serve as actuators or sensors. The first appearance of the term 'hydrogel' in the literature was in 1894.

2. **Organogels:**

An organogel is a non-crystalline, non-glassy thermoreversible (thermoplastic) solid material composed of a liquid organic phase entrapped in a three-dimensionally cross-linked network. The liquid can be, for example, an organic solvent, mineral oil, or vegetable oil. The solubility and particle dimensions of the structuring are important characteristics for the elastic properties and firmness of the organogel. Often, these systems are based on selfassembly of the structuring molecules.

Organogels have potential for use in a number of applications, such as in pharmaceuticals, cosmetics, art conservation, and food

3. **Xerogels:**

A xerogel is a solid formed from a gel by drying with unhindered shrinkage. Xerogels usually retain high porosity (15–50%) and enormous surface area (150–900 m2 /g), along with very small pore size (1–10 nm). When solvent removal occurs under supercritical conditions, the network does not shrink and a highly porous, low-density material known as an aerogel is produced. Heat treatment of a xerogel at elevated temperature produces viscous sintering (shrinkage of the xerogel due to a small amount of viscous flow) which results in a denser and more robust solid, the density and porosity achieved depend on the sintering conditions.

4. **Nanocomposite hydrogels:**

Nanocomposite hydrogels or hybrid hydrogels, are highly hydrated polymeric networks, either physically or covalently crosslinked with each other and/or with nanoparticles or nanostructures. Nanocomposite hydrogels can mimic native tissue properties, structure and microenvironment due to their hydrated and interconnected porous structure. A wide range of nanoparticles, such as carbon-based, polymeric, ceramic, and metallic nanomaterials can be incorporated within the hydrogel structure to obtain nanocomposites with tailored

functionality. Nanocomposite hydrogels can be engineered to possess superior physical, chemical, electrical, thermal, and biological properties.

- **[1.2.2] Different types of polymers used in formulation of gel: (Gel forming substances)**

Several polymers are used to provide the structural network that is the essence of a gel system. These include natural gums, cellulose derivatives, and carbomers. Although most of these function in aqueous media, several polymers that can gel nonpolar liquids are also available. Certain colloidal solids behave as gallants as a result of asymmetric flocculation of the particles. High concentration of some non-ionic surfactants can be used to produce clear gel in systems containing up to about 15% mineral oil. These are employed mostly as hair dressings. Gel forming polymers are classified as follows:

A. Natural polymer

1. Agar
2. Alginates
3. carrageenan
4. Tragacanth
5. Pectin
6. Xanthan
7. Gellan Gum
8. Guar Gum
9. Other gums
10. Chitosan etc.

B. Semi synthetic polymers

1. Cellulose derivatives
2. Carboxymethyl cellulose
3. Methylcellulose
4. Hydroxypropyl cellulose
5. Hydroxy propyl (methyl cellulose)
6. Hydroxyethyl cellulose etc.

C. Synthetic polymers

1. Carbomer
2. Carbopol 934
3. Carbopol 940
4. Carbopol 980 etc
5. Poloxamer/surfactants
6. Polyacrylamide
7. Polyethylene and its co-polymers

D. Inorganic Substances

1. Microcrystalline silica
2. Clays

E. Other gallants

1. Beeswax
2. Cetyl ester wax
3. Aluminium staerate etc

A. Natural polymers:

Natural gums have been used in commerce since the beginning of recorded history. Typically, they are branched-chain polysaccharides. Most are anionic (negative charged in aqueous solution or dispersion), although a few, such as gaur, are neutral molecules. Differences in proportion of the sugar building blocks that make up these molecules and their arrangement and molecular weight result in significant variations in gum properties. Because of their chemical makeup, neutral gums are subjected to microbial degradation and support microbial growth. Aqueous systems containing gums should contain a suitable preservative. As mentioned earlier, cationic antimicrobials are not generally compatible with the anionic gums and should usually be avoided. Although many of the most familiar gums are plant exudates of extracts, other sources are also used.

1. **Alginates:** These polysaccharides containing varying proportion of D-mannuronic and L-guluronic acids are derived from brown seaweed in the form of monovalent and divalent salts. Although other alginate salts are available commercially, sodium alginate is by far the most widely used. Gelation occurs by reduction of pH or reaction with divalent cations. Reduction of pH converts the carboxylate ions to free carboxyl groups. This reduces hydration of polymer segments as well as the repulsion between them. Generally, some calcium must be present; the small amounts contributed by the alginate may be sufficient. The pH at which gelation occurs calcium begins to gel below a pH 4. Gel strength is a function of alginate concentration; 0.5% is a practical minimum

2. **Carrageenan:** All the carrageenan are anionic. Carrageenan, the hydrocolloid extracted from red seaweed, is a variable mixture of sodium, potassium, ammonium, calcium and magnesium sulphate esters of polymerized galactose, and 3,6-anhydrogalactose. The main copolymer types are labelled kappa-, iota-, and lambda-carrageenan. Kappa and iota fraction form thermally reversible gels in water. This has been ascribed to a temperature-sensitive molecular rearrangement. At high temperature, the copolymers exist as random coils; cooling result in formation of double helices that act as cross-links.

3. **Tragacanth:** Trgacanth is defined in the NFas the “dried gummy exudation from Astragalus gummifer Labillardiere, or other Asiatic species of Astragalus. Tragacanth is a complex material composed of chiefly of acidic polysaccharide (tragacanth acid) containing calcium, magnesium, and potassium, and a smaller amount of a neutral polysaccharide, tragacanthin. The gum swells in water; concentrations of 2 % or above a “high-

quality" gum produce a gel.

4. **Pectin:** Pectin, the polysaccharide extracted from the inner skin of citrus fruit or apple pomace, may be used in pharmaceutical jellies as well as in foods. The gel is formed at an acid pH in aqueous solutions containing calcium and possibly another agent that acts to dehydrate the gum.

5. **Xanthan gum:** Although xanthan gum is used most frequently as a stabilizer in suspensions and emulsions at concentrations below 0.5%, higher concentrations in aqueous media yield viscid solutions that are jellylike in nature. Xanthan gum is produced by bacterial fermentation, and other its availability and quality are not subject to many of the uncertainties that affect other natural products, particularly those that are extracted from plants whose habitat falls within politically unsettled part of the world. Thermally reversible gels result from combinations of xanthan with gaur or locust bean gum.

6. **Gellan gum:** Gellan gum is another polysaccharide produced by fermentation that has FDA clearance for use in foods. The gum is highly efficient; as little as 0.05% is required for gel formation. Gels will not form in the absence of free cations. While both monovalent and divalent ions can include gelation, the divalent ions are required in much lower concentration, roughly 1/25 the concentration of monovalent ions. To produce a uniform gel, the gum is first dissolved in deionized water heated to 70-75°C.

7. **Guar gum:** Guar gum is a non-ionic polysaccharide derived from seeds. Aqueous guar solutions can be crosslinked by several polyvalent cations to form gels. The mechanism is believed to involve chelate formation between groups in different polymer chains. A disadvantage of these gels is the presence of insoluble plant residue.

8. **Other gums:** Gelatine is used widely as a bodying agent and gel former in the food industry, and occasionally in pharmaceutical products. Agar can be used to make firm gels; it is most frequently used in culture media.

9. **Chitosan:** Chitosan is a natural biopolymer derived from the outer shell of crustaceans. Chitin is extracted and partially deacetylated to produce chitosan. Unlike most gums, chitosan carries a positive charge and is thus attracted to a variety of biological tissues and surfaces that are negatively charged. Various derivatives are being explored for specific applications. Concentrated aqueous solutions have a gel-like consistency. Firmer gels result from interaction with polysaccharides, such as alginate.

B. Semi synthetic polymers:

1. **Cellulose derivatives:** Many useful derivatives are fashioned from cellulose, a natural structure polymer found in plants. Treatment in the presence of various active substances results in breakdown of the cellulose

backbone as well as substitution of a portion of its hydroxyl moieties. The major factors affecting rheological properties of the resultant material are the nature of the substitution(s), degree of substitution, and average molecular weight of the resultant polymer. Carboxymethylacellulose: Carboxymethylcellulose, also known as sodium carboxymethylcellulose, CMC, and cellulose gum, is an anionic polymer available in a variety of grades that differ in molecular weight and degree of substitution. Gelation requires addition of an electrolyte with a polyvalent cation to a solution of the polymer; aluminum salts are proffered.

2. **Methylcellulose:** Methylcellulose is an example of a polymer whose solubility in water decreases as the temperature is raised. If an aqueous solution is heated, viscosity increases markedly at a certain point as the result of aqueous solution is heated, viscosity increases markedly at a certain point as the result of formation of gel structure. This property, known as thermal gelation, is a function of polymer chemistry and the presence of additives. The gelation temperature range for methocel type A is 50-55 °C. Salts and sugars with a high affinity for water lower the gelation temperature whereas alcohol and propylene glycol have the opposite effect.

3. **Other cellulose derivatives:** Hydroxypropyl cellulose is soluble in water as well as many polar organic solvents. Consequently, it is useful as a gelling agent for such liquids and for mixture of water and various organic liquids, such as alcohol, that adversely affect the rheological properties of gums and certain other hydrophilic agents. High molecular weight grades of hydroxypropyl cellulose and hydroxyethyl cellulose, though highly viscous, behave as fluids and do not exhibit a yield value.

C. Synthetic polymers:

1. **Carbomer:** Carbopol® polymers, along with Pemulen polymeric emulsifiers are all cross-linked. They swell in water up to 1000 times their original volume (and ten times their original diameter) to form a gel when exposed to a pH environment between 4.0 - 6.0. Since the pKa of these polymers is 6.0 ± 0.5, the carboxylate groups on the polymer backbone ionize, resulting in repulsion between the negative charges, which adds to the swelling of the polymer. Cross-linked polymers do not dissolve in water. The glass transition temperature of Carbopol polymer is 105°C in powder form. However, the glass transition temperature drops dramatically as the polymer comes into contact with water. The polymer chains starts gyrating and the radius of gyration becomes larger. Macroscopically, this phenomenon manifests itself as swelling. Carbopol polymers and co-polymers are used mainly in liquid or semisolid pharmaceutical formulations as suspending or viscosity increasing agents. Formulations include creams, gels and ointments. Carbopol polymers are also employed as emulsifying agents in the preparation of o/w emulsions for external use and are also employed in cosmetics (C. Rowe, 2003)

2. **Poloxamer/surfactants:** Poloxamer is a synthetic block copolymer of ethylene oxide and propylene oxide. Their molecular weight ranges from 1000-15000. In a molecule the hydrophilic poly (oxyethylene) sand witches the hydrophilic poly (oxypropylene) thereby the polo oxypropylene occupies a central position in the molecule and it is flanked by two hydrophilic polyoxyethylene blocks. The differences in the chain length of the

polyoxyethylene and polyoxypropylene chains in different products are responsible for the divergences in their physical, chemical and practical properties.

3. **Polyethylene and its co-polymers:** Various forms of polyethylene and its copolymers are used to gel hydrophobic liquids. The result is a soft, easily spreadable semisolid that forms a water-resistant film on the skin surface. Polyethylene itself is a suitable gellant for simple aliphatic hydrocarbon liquids but may lack compatibility with many other oils found in personal care products. For, these, copolymers with vinyl acetate and acrylic acid may be used, perhaps with the aid of a co-solvent. To form the gels, it is necessary to disperse the polymer in the oil at elevated temperature (above 80 °C) and then shock cool to precipitate fine crystals that make up the matrix.

D. Inorganic Substances:

Certain finely divided solids can function efficiently as thickening agents in various liquid media. Gel formation depends on establishment of a network in which colloidal particles of the solid are connected in an asymmetric fashion. This requires mutual attraction of the particles (flocculation) and partial wetting by the liquid.

1. **Microcrystalline silica:** Microcrystalline silica can function as a gallant in a wide range of liquids. Network formation results from attraction of the particles by polar forces, principally hydrogen bonding. An important commercial application of silica is its use in dentifrices. Microcrystalline silica acts as a bonding agent that provides thixotropy to the formation; at the same time, the required concentration of polishing agents is required.

2. **Clays:** Montmorillonite clays are capable of swelling in water as the result of hydration of exchangeable cations and electrostatic repulsion between the negatively charged faces. At high concentration in water, thixotropic gels are formed because the particles combine in a flocculated structure in which the face of one particle is attracted to the edge of a not.

- **[1.3] Advantage and disadvantage of gel:**

Advantages:

1. Gels are used to achieve optimal cutaneous and percutaneous drug delivery
2. They can avoid gastrointestinal drug absorption difficulties caused by gastrointestinal pH.
3. Gels are having property to avoid enzymatic activity and drug interaction with food and drinks
4. They can substitute for oral administration of medication when the route is unsuitable.

5. They can avoid the first pass effect, that is, the initial pass of drug substance through the human body.
6. They avoid systemic and portal circulation following gastrointestinal absorption.
7. Gels are not deactivated by liver enzymes because the liver is bypassed.
8. They are non-invasive and have patient compliance.
9. They are applied over skin for slow and prolonged absorption.
10. Gels have also been applied in pharmacy to some viscous suspension for oral use for example Aluminium hydroxide gel.
11. They have localized effect with minimum side effects.

Disadvantages:

1. Gels are used to achieve optimal cutaneous and percutaneous drug delivery.
2. They can avoid gastrointestinal drug absorption difficulties caused by gastrointestinal pH.
3. Gels are having property to avoid enzymatic activity and drug interaction with food and drinks.
4. They can substitute for oral administration of medication when the route is unsuitable.
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➢ AIM

FORMULATION AND EVALUATION OF ANTI MIRCOBIAL & HEALING POTENTIAL POLYHERBAL GEL

➢ OBJECTIVE

A drug delivery system enables the introduction of a therapeutic substance in the body and improves its efficacy and safety by controlling the rate, time and place of release of drug in the body. One of these includes topical preparations. These are used for localized effect at the site of their application. With lots of synthetic and inorganic drugs used in the market for treatment of various diseases; natural drugs have also gained appreciation and still has high market demand even today. Natural drug helps by reducing toxicity and any adverse drug effects and thus adding for better pharmacological effect. Tridax procumbens which is active ingredient obtained from the powdered dry leave of the plant Tridax procumbens (which is commonly called cotton

button.

An approach is being made in combining the old tradition with the new technology to gain more appreciation in the market. This leads to the formulation of "Herbal extract loaded gel" as a Novel Drug Delivery.

➢ Material used for formulation of gel:

Carbopol 934, Methyl paraben, Propyl paraben, Propylene glycol 400, Triethanolamine, distilled water, Tridax procumbens extract,lavender oil

Tabel : Ingredients list

Sr.No.	INGREDIENTS	USES
1.	Tridax procumbens	Anti-microbial, wound healing properties, Anti- Bacterial, Anti- oxidant & Anti - inflammatory
2.	Lavender Oil	Fragrance, Anti-microbial, Anti-oxidant
3.	Carbopol 934	Gelling Agent
4.	Methyl paraben	Preservative
5.	Propyl paraben	Preservative
6.	Propylene glycol 400	Solubility
7.	Glycerine	Plasticizers
8.	Triethanolamine	Neutralizer
9.	Distilled water	As a vehicle

2. EXPRIMENTAL METHOD

➢ Preparation of Tridax procumbens Extract

T. procumbens leaves were collected from B PHARMACY COLLEGE, RAMPURA and cleaned thoroughly with water. After washing, the leaves were allowed to shade dry for 3-4 days and ground and sieved to get rid of coarse particles.10 g of powdered sample was soaked in 100 ml of distilled water overnight at 37℃.The extract was boiled for 1 hr on water bath.Then the extract was filtered using Whatman filter paper.

➢ Preparation of Gel

For the preparation of gel formulation, firstly take carbopol 934 which was then dispersed in distilled water (methyl paraben, propyl paraben) and glycerine overnight. Take the extract of Tridax procumbens in propylene glycol which was then added in polymer dispersion. Remaining quantity of water was then added and neutralized to pH 7 with triethanolamine by constant stirring for 10 minutes.

3. METHOD OF FORMULATION

Sr. No.	Ingredients	Quantity in gm or ml		
		F1	F2	F3
1.	Tridax procumbens	0.20gm	0.40gm	0.60gm
2.	Lavender Oil	0.02ml	0.02ml	0.02ml
3.	Carbopol 934	1.0ml	1.0ml	1.0ml
4.	Methyl paraben	0.2ml	0.2ml	0.2ml
5.	Propyl paraben	0.1ml	0.1ml	0.1ml
6.	Propylene glycol 400	10.0ml	10.0ml	10.0ml
7.	Glycerine	1.0ml	1.0ml	1.0ml
8.	Triethanolamine	Qs	Qs	Qs
9.	Distilled water	100ml	100ml	100ml

4. EVALUATION OF HERBAL HAND WASH

A. **Physical Evaluation:**

Physical parameters such as colour, odour and consistency were checked visually.

i. Colour: The colour of the formulation was checked by visual inspection.

ii. Consistency: The consistency formulation was checked by applying on skin.

iii. Odour: The odour of the formulation was checked by mixing the gel in water and observing the smell

B. **Measurement of ph.:**

The pH of gel formulation was determined by using digital pH meter. Take 1 gm of gel and dissolved in 10 ml of distilled water and keep apart for two hours. Then the measurement of pH of formulation was done by dipping the glass electrode completely into the gel system three times and the average values are reported.

C. **Homogeneity:**

All prepared gel formulations were tested for homogeneity by visual inspection after the gels have been set in to the container. They were tested for their presence and appearance of any aggregates.

D. **Viscosity:**

The measurement of viscosity of the formulated gel was determined by Brookfield Viscometer with round spindle at room temperature. The gels were rotated at speed 0.3, 0.6 and 1.5 rotations per minute and at each speed, the corresponding dial reading was noted. Then viscosity of the prepared gels was obtained by multiplications of the dial reading with factor given in the Brookfield Viscometer catalogues.

E. **Spreadability:**

Formulation placed between two glass slides and 100gm weight was placed on the upper glass slide for 5 min to

compress the formulation to uniform thickness. Weight 50 gm was added to the pan. The time in seconds require to separate the two slides was taken as measure of spreadability

5. RESULT AND DISCUSSIONS

a. Physical Evaluation:

Formulations	color	Odour	Characteristics
F1	Transparent	Characteristic	Good
F2	Transparent	Characteristic	Good
F3	Transparent	Characteristic	Good

b. pH

Formulations	pH
F1	6.92
F2	6.43
F3	6.76

c. Spreadability

Formulations	Spreadability
F1	6.9
F2	6.2
F3	6.3

d. Viscosity

Formulations	RPM	Viscosity
F1	60	38
F2	60	37.6
F3	60	39.2

e. Antimicrobial

Formulations	Microbial Growth
F1	Passed (E.coli Absent)

Discussion:

• From the above results it is clearly shows that all the prepared gel formulations was yellowish green in color and having good homogeneity and gelling property. The pH of all gel formulations was in the range compatible with normal pH range of skin.

• The rheological behaviors of gel formulations were studied with Brookfield viscometer which indicated that the viscosity of gel formulation was consistent neither too thick nor too thin. The study of spreadability

shows that with increasing the viscosity of formulation spreadabilty decrease and its vice-versa.

• The gelling strength and extrudability is found in the suitable range. Thus overall, the gel formulation complies with all parameters of an ideal gel. Accelerated stability studies indicated that the physical appearance, rheological properties, extrudability, spreadability in the optimized formulation remain unchanged upon storage for 1 month.

6. CONCLUSION

In Indian system of medicine majority of herbal products are made by using crude plant or portion of plant parts and their extracts.The leaves extract of Tridax procumbens plant belongs to family asteraceae was taken for this present study and formulated for the topical gel and its properties. The gel prepared using Tridax procumbens leaf extract was found to be good with respect to homogenecity, spredability, pH, viscosity, microbial growth, antimicrobial activity.

Herbal gel formulation containing leaf extract of Tridax procumbens was successfully prepared with carbopol 934 as a gelling agent. The contents of developed herbal extract based gel were propylene glycol as plastisizer, methyl and propyl paraben as preservative and distilled water and carbopol 934 as gelling agent.

7. FINAL FORMULATED POLYHERBAL GEL

8. ACKNOWLEDGEMENT

➢ *In the present world of competition there is a race of existence in which those are having will to come forward succeed. Project is like bridge between practical and theoretical working. With this willing we selected this practical work to perform and formulate herbal loaded gel.*

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