A Review on Therapeutic Potential and Transdermal Applications of *Cynodon Dactylon* (Durva) In The Treatment of Herpes

Priya Sanjay Sarode, Avinash. V. Dhobale, Sonal A.Phule Dr. R. V. Shete

RAJGAD DNYANPEETH'S COLLEGE OF PHARMACY BHOR -PUNE -412206

DR. B.B KHALADKAR College of Pharmacy, Wakhari, Tal-Daund, Dist-Pune 412203

Gmail – Priyasarode137@Gmail.Com

Abstract

Cynodon dactylon (Durva), commonly known as Bermuda grass, is one of the most valued medicinal plants in Ayurveda and other traditional systems of medicine. It exhibits a wide range of pharmacological activities including antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and wound healing effects. Despite its established therapeutic potential, the clinical use of *Cynodon dactylon* remains limited due to poor aqueous solubility, instability, and low bioavailability of its active phytoconstituents. Transdermal drug delivery systems (TDDS) provide an effective alternative approach for enhancing the delivery and sustained release of such bioactive compounds. This review focuses on the phytochemical composition and pharmacological significance of *Cynodon dactylon*, highlighting recent developments in its transdermal applications and formulation strategies. It also discusses the need for further studies to establish *Cynodon dactylon* as a promising herbal candidate in modern pharmaceutical formulations.

Keywords: *Cynodon dactylon*, Durva, transdermal patch, herbal formulation, pharmacological activity, wound healing

Introduction

Fig no.1. cynodont dactylon

Herbal medicines have been used since ancient times for the prevention and treatment of various diseases. The growing global interest in natural remedies is primarily due to their wide therapeutic range, better patient tolerance, and minimal side effects compared to synthetic drugs. In recent years, the pharmaceutical industry has shifted its attention toward the integration of herbal extracts into modern dosage forms to achieve enhanced bioavailability and controlled drug release. Among these approaches, transdermal drug delivery systems have emerged as one of the most efficient methods, providing a non-invasive, convenient, and controlled route of administration.

Cynodon dactylon (L.) Pers., commonly known as Durva or Bermuda grass, belongs to the family Poaceae and is widely distributed in tropical and subtropical regions. In Ayurveda, Durva is regarded as a sacred plant and is traditionally used for its hemostatic, diuretic, anti-inflammatory, and wound healing properties. It has also been employed in folk medicine for the treatment of urinary tract infections, skin diseases, and liver disorders. The plant contains a variety of bioactive constituents responsible for its broad spectrum of pharmacological actions. However, like many herbal extracts, its therapeutic application through oral routes faces limitations such as poor solubility and degradation in the

gastrointestinal tract. Therefore, incorporating *Cynodon dactylon* extract into transdermal systems such as patches, gels, and films can significantly improve its

therapeutic potential by enabling sustained release and improved bioavailability.

2. Botanical Description of *Cynodon dactylon*

Cynodon dactylon is a perennial grass species that thrives in warm and humid climates. It grows abundantly in lawns, agricultural fields, and wastelands, making it easily accessible for medicinal purposes. The plant spreads rapidly through creeping rhizomes and stolons, forming dense mats of turf. The leaves are slender, flat, and grayish-green in color, while the stems are smooth and erect. The flowering heads consist of digitate spikes that bear small spikelets. The roots are fibrous and deeply penetrate the soil, allowing the plant to survive under various environmental conditions.

Table 1: Botanical Classification of *Cynodon dactylon*

Taxonomic Rank	**Description**
Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Poales
Family	Poaceae
Genus	Cynodon
Species	*C. dactylon* (L.) Pers.
Common Name	Durva, Bermuda Grass
Parts Used	Whole plant, leaves, roots, rhizomes

Taxonomically, *Cynodon dactylon* belongs to the Kingdom Plantae, Division Magnoliophyta, Class Liliopsida, Order Poales, Family Poaceae, and Genus *Cynodon*. It is native to India but is now naturalized throughout Asia, Africa, and the Americas. The parts of the plant used for medicinal purposes include the leaves, roots, and whole plant extract. The plant flourishes in tropical climates and is harvested throughout the year, making it a sustainable and renewable source of phytoconstituents for pharmaceutical applications.

3. Phytochemical Constituents

The therapeutic efficacy of *Cynodon dactylon* is primarily attributed to its rich and diverse phytochemical profile. Phytochemical investigations have revealed the presence of several classes of bioactive compounds such as flavonoids, alkaloids, sterols, terpenoids, glycosides, phenolic acids, tannins, and saponins. The major bioactive constituents include apigenin, luteolin, β-sitosterol, stigmasterol, triterpenoids like lupeol and taraxerol, as well as phenolic compounds such as ferulic acid and caffeic acid.

Table 2: Major Phytochemical Constituents of *Cynodon dactylon*

Phytochemical Class	**Major Constituents**	**Reported Activity**
Flavonoids	Apigenin, Luteolin	Antioxidant, anti-inflammatory
Sterols	β-sitosterol, Stigmasterol	Hypocholesterolemic, wound healing
Alkaloids	Cynodin, Cynodinine	Analgesic, antimicrobial
Terpenoids	α-amyrin, β-amyrin	Hepatoprotective
Glycosides	Cardiac glycosides	Antioxidant
Phenolics	Tannins, Gallic acid	Astringent, antimicrobial

Flavonoids and phenolic compounds are responsible for the plant's strong antioxidant and anti-inflammatory activities by scavenging free radicals and reducing oxidative stress. Sterols such as β-sitosterol contribute to membrane stabilization and exhibit anti-inflammatory and hypocholesterolemic effects. wound healing and possess hepatoprotective and antimicrobial activities. The presence of alkaloids and glycosides further adds to the pharmacological potential of the plant by supporting its antidiabetic and analgesic actions. Together, these phytoconstituents make *Cynodon dactylon* a multi-functional herb suitable for both systemic and topical therapeutic applications.

4. Pharmacological Activities

Cynodon dactylon exhibits a wide range of pharmacological properties supported by both traditional knowledge and scientific studies. Its anti-inflammatory activity has been extensively investigated using different experimental models. Methanolic and ethanolic extracts of the plant have shown significant inhibition of carrageenan-induced paw edema in rats, which indicates suppression of inflammatory mediators such as prostaglandins and nitric oxide. Flavonoids like apigenin and luteolin play a key role in reducing inflammation through the inhibition of cyclooxygenase and lipoxygenase pathways.

The antioxidant activity of *Cynodon dactylon* is another important aspect of its therapeutic potential. The presence of phenolic and flavonoid compounds contributes to its strong free radical scavenging ability, which helps in protecting biological tissues from oxidative stress and damage. Various studies employing DPPH and FRAP assays have demonstrated that extracts of the plant effectively neutralize reactive oxygen species, thus preventing lipid peroxidation and cellular damage.

The plant also possesses potent antimicrobial properties. Extracts prepared from its leaves and roots exhibit inhibitory effects against a broad range of Gram-positive and Gram-negative bacteria such as *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Its antifungal activity against *Candida albicans* and other fungal species supports its traditional use in treating skin infections and wounds. The antimicrobial action is attributed to the synergistic effects of flavonoids, terpenoids, and phenolic compounds that disrupt microbial cell membranes.

The wound healing property of *Cynodon dactylon* has been well-documented in several studies. Topical application of the extract enhances the rate of wound contraction and epithelialization. Histopathological observations reveal increased fibroblast proliferation, collagen deposition, and angiogenesis at the wound site. The healing effect is associated with the combined action of triterpenoids and flavonoids, which promote tissue regeneration and reduce inflammation. In addition, *Cynodon dactylon* shows hepatoprotective activity by preventing liver damage induced by toxic agents such as carbon tetrachloride. It enhances the levels of endogenous antioxidant enzymes such as superoxide dismutase and catalase, thereby maintaining hepatic integrity. Furthermore, the plant exhibits hypoglycemic and analgesic properties, which expand its therapeutic potential in metabolic and pain-related disorders.

5. Transdermal Drug Devlivery System

Now a day many drugs are administered orally, but they are observed not more effective as desired so to upgrade such character TDDS was created. Drug delivery administered by the skin and attain a systemic effect of drug is called as transdermal drug delivery system. These are kind of dosage form which includes drug transport to reasonable epidermis and potentially dermal tissue of the skin locally therapeutic effect. While an exceptionally significant division of the drug is transported in systemic blood circulation. A transdermal dermal patch is characterized as a medicated adhesive patch which is set over the skin to deliver a particular dose of medication by the skin with a fore ordained rate of release to reach into the circulation system

Types of TDDS

1.Reservoir System-Drug stored in liquid/gel reservoir controlled release through membrane

2. Matrix System-Drug dispersed in polymer matrix drug released by diffusion

3. Drug-in-Adhesive system-drug mixed within adhesive layer Thin, flexible patches

4. Microneedle System-Tiny microneedles create micro-channels Enhances skin penetration

5. Iontophoresis-uses mild electrical current Pushes drug across skin

6. Sonophoresis-uses ultrasound waves increases permeability of skin

7. Electroporation-high-voltage short pulses creates temporary pores in skin

8. Nano-carrier based TDDS-Uses nanoparticles/liposomes improves drug absorption

Advantages –

- Self-medication is possible
- Side effect gets reduced
- Plasma drug concentration becomes maintained
- Drug duration of action are extendable
- GIT incompatibilities get avoided
- Number of dosage frequency reduced
- Easier to remember and used
- Large area of application in comparison with nasal and buccal cavity

Disdvantages –

- Chances to allergic reaction
- High molecular drug level cannot to attain therapeu level
- It is Deliver to ionic drug
- It requires significant lag time

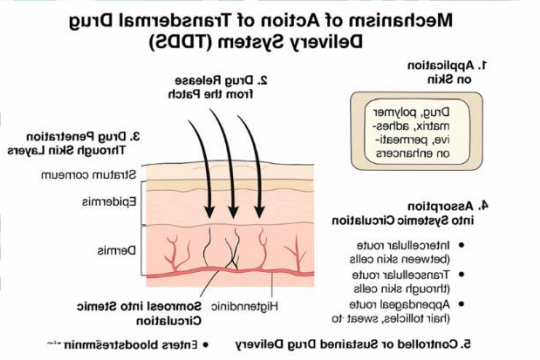

fig. no.2 mechanism of action

Patch Size:

- Small: 2–5 cm²
- Medium: 5–20 cm²
- Large: 20–40 cm²
- Very Large: >40 cm² (rare, for low-potency drugs)
- Common size range: 5–30 cm²

Patch Shape:

•Square Patch-Easy to manufacture Uniform, drug distribution

•Rectangular Patch- Most commonly used better skin fitting area

•Circular / Round Patch- Good for sensitive areas Reduced peeling at edges

• Oval Patch-Comfortable and flexible Better, adhesion during movement

Matrix Band-Aid Shape -Rounded corners to prevent lifting, Used in clinical patches

6. Need for Transdermal Application

Although *Cynodon dactylon* demonstrates promising pharmacological effects, its therapeutic efficiency via the oral route is limited by factors such as poor water solubility, low permeability, and extensive first-pass metabolism. Many of its bioactive compounds are lipophilic and degrade in the gastrointestinal environment, leading to poor systemic absorption and bioavailability. Transdermal drug delivery provides an innovative solution to these challenges by delivering drugs directly through the skin into systemic circulation, thus avoiding hepatic metabolism and gastrointestinal degradation.

Transdermal systems offer several advantages including sustained and controlled release of active constituents, improved patient compliance, and minimized side effects. In addition, the skin provides a large surface area for drug absorption and allows self-administration without the need for medical supervision. The lipophilic nature of *Cynodon dactylon* constituents makes them ideal candidates for transdermal absorption. Formulating its extracts into transdermal systems can therefore provide better therapeutic outcomes for conditions such as inflammation, pain, and wound healing.

fig. no. 3

Herpes is a very common, incurable viral infection caused by the herpes simplex virus (HSV), which remains in the body for life but can be managed effectively with antiviral medications. It is primarily transmitted through skin-to-skin contact, including sexual contact. The virus spreads through skin-to-skin contact, such as transmitted even when no sores are visible. It can also be spread through contact with infected bodily fluids or shared items like razors or utensils.

- **Cynodon Dactylon Has Bioactive Compounds That Can Help Manage Herpes Symptoms By**
- Inhibiting viral replication
- Reducing inflammation and pain
- Promoting wound healing

7.Types Of Herpes Viruses:

1.**HSV-1 (Herpes Simplex Virus Type 1)** Causes: Oral herpes (cold sores) Affects: Mouth, lips, face Spread

2.**HSV-2 (Herpes Simplex Virus Type 2)** Causes: Genital herpes Affects: Genital or anal area Spread: Sexual contact

3.**VZV (Varicella-Zoste virus)** Causes: Chickenpox and Shingles Affects: Skin, back, chest Spread: Airborne or contact with blisters

4. **EBV(Epstein–BarrVirus)** Causes: Mononucleosis Affects Throat, lymphnode spread; through saliva

5.**CMV (Cytomegalovirus)** Causes:CMV infection Affects: Various organs Spread: Body fluids (blood, saliva, milk)

6.**HHV-6 & HHV-7** Causes: Roseola (in infants) Affects; Skin Spread: Saliva

7.**HHV-8**Causes: Kaposi's Sarcoma (in HIV) Affects: Skin, internal organ Spread

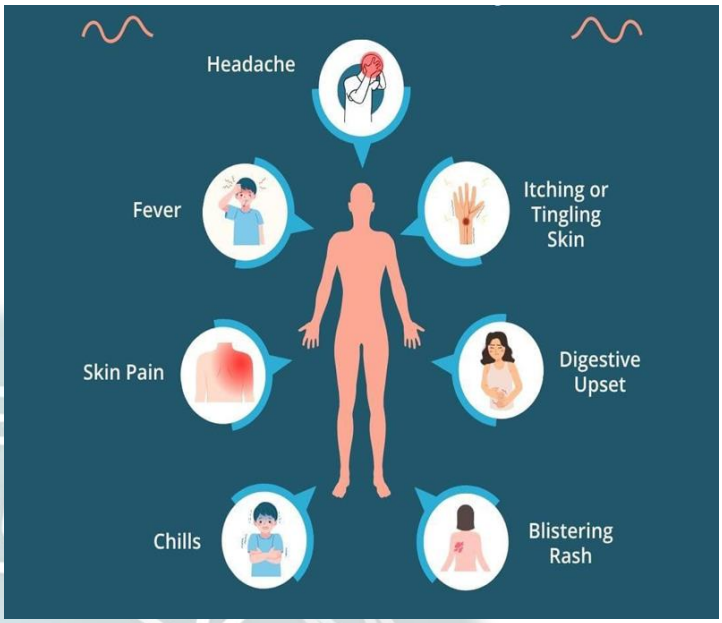

Fig.no.4 herpes symptoms

Exraction Method

Plant extraction-

the plant material (e.g leaves) under running water and then shade dry or air dry it at a controlled temp. Powder coarsely grind the dried plant material into a powdered using a mechanical grainder and mill

Solvent extraction –

Maceration -macerate powdered plant material a solvent like ethanol at room temp. for 24hrs with occasional shanking filter the mixture to separate the liquid extract from solid residuce

Soxhlet extraction –

after defatting extract the material with a more polar solvent like methanol or ethanol perform the extraction for a specific time e.g 72hrs . at controlled temp. in Soxhlet apparatus

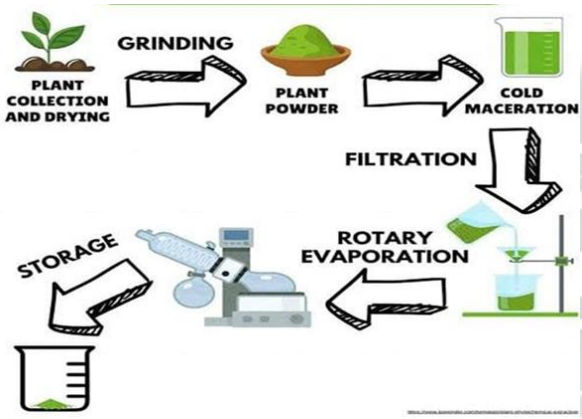

Fig. no.5

Formulation table

Component	Function
Cynodon dactylon extract	Therapeutic agent
Film forming polymer (HPMC, PVA)	Form the patch matrix
Pressure-sensitive adhesive (acrylic adhesive)	Makes patch stick to skin
Plasticizer (PEG 400 or glycerol)	Improve flexibility
Penetration enhancer (propylene glycol, oleic acid)	Improves drug permeation through skin
Solvent (ethanol, water)	Dissolves polymers & extract for casting

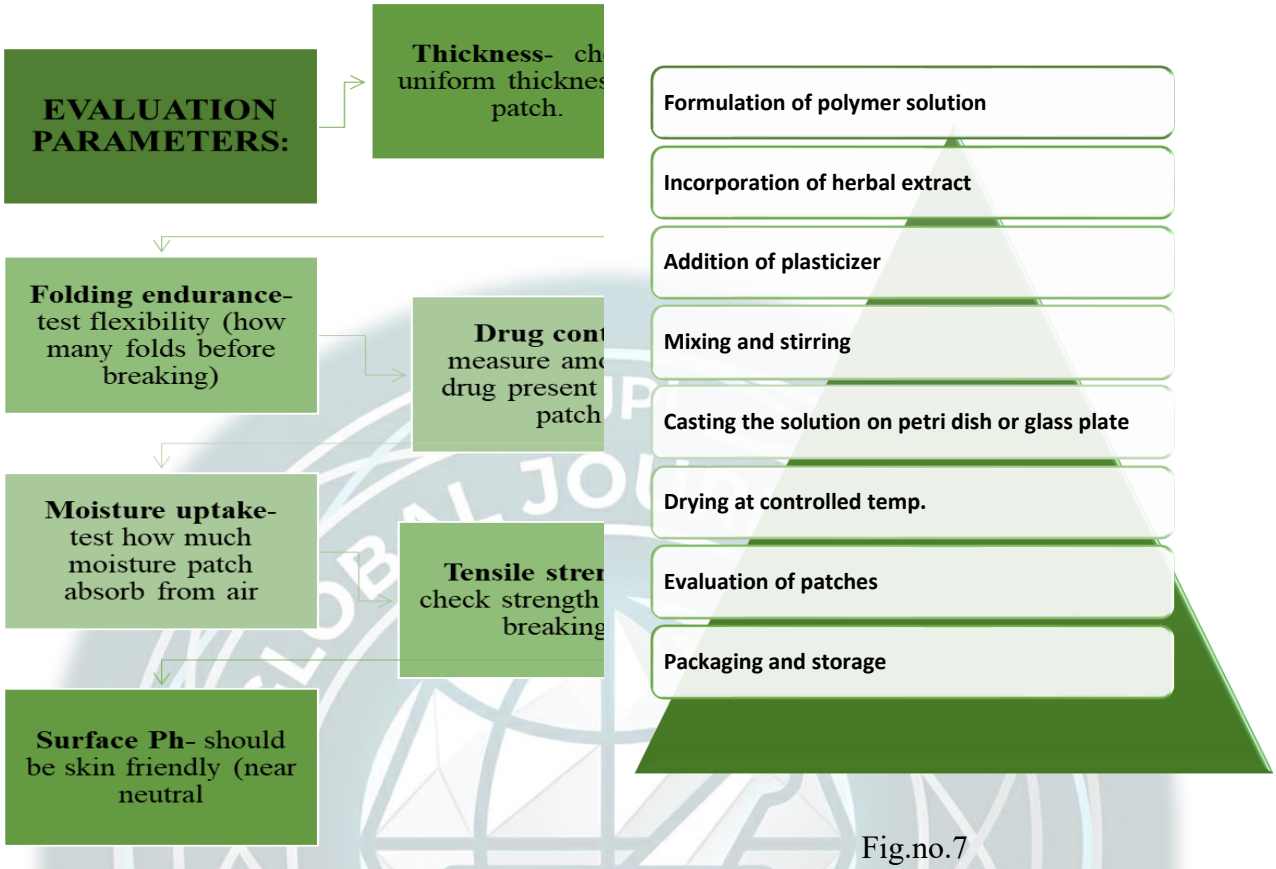

Fig.No.6. Evaluation Parameters

Fig.no.7

Preparation of Herbal Transdermal Patch

Table 3: Typical Components of Herbal Transdermal Patch

Component	Examples	Function
Polymer	HPMC, PVP, Eudragit RL	Film-forming agent
Plasticizer	PEG 400, Glycerol	Flexibility and smoothness
Solvent	Ethanol, Chloroform	Dissolution medium

Drug/Extract	*C. dactylon* extract	Active ingredient
Permeation enhancer	Oleic acid, DMSO	Improves skin permeability

9. Future Prospects

Cynodon dactylon (Durva) shows strong antioxidant, anti-inflammatory and wound-healing potential, but more scientific evidence is needed. Future work should focus on **standardizing extracts**, identifying key active compounds, and performing **clinical studies** to confirm safety and effectiveness.

In transdermal delivery, advanced systems like **nanoparticles, gels, patches and microneedles** can improve skin penetration of Durva extracts. More studies are required on **skin permeation, stability, toxicity and long-term safety**.

There is also a need to develop **sustainable cultivation**, proper **quality-control methods**, and clear **regulatory guidelines** for commercial formulations. Collaboration between researchers, pharmacists and clinicians can help convert Durva's traditional uses into **modern, evidence-based transdermal products**.

10. Conclusion

Cynodon dactylon (Durva) is a highly valuable medicinal plant possessing a wide range of pharmacological activities supported by traditional and scientific evidence. Its phytochemical richness, comprising flavonoids, sterols, and triterpenoids, accounts for its potent antioxidant, anti-inflammatory, and wound healing properties. The incorporation of *Cynodon dactylon* extract into transdermal formulations represents a novel and effective strategy for enhancing the bioavailability and controlled release of its active constituents. Transdermal delivery not only improves patient compliance but also provides targeted and sustained therapeutic action. Further research focusing on formulation optimization, permeability enhancement, and clinical validation will help establish *Cynodon dactylon* as a reliable and efficient natural alternative for modern pharmaceutical applications.

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