FORMULATION AND EVALUATION OF TRANSDERMAL PATCH OF CYNODONT DACTYLON FOR TREATMENT OF HERPES

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ABSTRACT

The Current Focuses on the Formulation and Evaluation of Herbal Transdermal Patch Containing Cynodon Dactylon (Durva) Extract, for the Treatment of Herpes Infection Using the Solvent Casting Technique. Cynodon Dactylon is well known for its Antiviral, Anti-Inflammatory, Antimicrobial,Which Help in Reducing Skin Infection and Promoting Faster Healing of Lesions Caused by Herpes. the Ethanolic Extract of Cynodon Dactylon Was Incorporated into a Polymeric Matrix Composed of Hydroxypropyl Methylcellulose (HPMC) And Polyvinyl Alcohol (PVA), While Glycerin Was Used as a Plasticizer to Improve Flexibility and Uniformity of the Patch. The Solvent Casting Technique was Employed to Prepare Transdermal Patches with Consistent Thickness and Smooth Surface Characteristics. the Prepared Patches were Evaluated for Various Physicochemical Parameters Such as Film Thickness, Folding Endurance, Tensile Strength, Surface pH, Moisture Content, and Drug Content Uniformity. in Vitro Drug Release Studies Demonstrated Sustained Release of Active Constituents Over a 24-Hour Period, Indicating the Potential for Prolonged Therapeutic Action. The Study Concludes That the Transdermal Patch Formulated Using the Solvent Casting Technique Offers a Promising Herbal Delivery System for Wound Management, Ensuring Controlled Release, Antimicrobial Protection, and Potential for Future Clinical Application.

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

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1. Introduction



Cynodon dactylon

Herbal medicines have been used since ancient times for the prevention and treatment of various diseases.[1] 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.[2]

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.[3] 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.[4]

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Transdermal Drug Delivery System:

Transdermal drug delivery is one of the most prevalent and widely utilized drug delivery methods. When compared to other routes of distribution, the transdermal route has attracted more attention in medication delivery due to its flexibility in palatability and convenience.[5] The transdermal route is one of the most appropriate, older, easy, safe, and cost-effective medication delivery methods. The main objectives of a transdermal medication delivery system are to arget a specific region of action and to manage the rate of delivery. Transdermal drug delivery devices are self-contained, discrete dosage forms that are applied to undamaged skin. release medications into the systemic circulation at a controlled rate[6] Wound healing is a complex physiological process involving multiple overlapping phases: hemostasis, inflammation, proliferation, and tissue remodeling. This intricate process can be hindered by factors such as microbial infection, oxidative stress, and chronic diseases, which delay healing and increase the risk of complications like chronic ulcers and secondary infections[6] Thus, there is a pressing need for wound care strategies that accelerate healing, prevent infection, and promote tissue regeneration. Herbal medicines have gained significant interest in wound management due to their broad pharmacological activities, low toxicity, and biocompatibility.

2. **Material and methods**

Material – The Fresh Cynodon Dactylon Plant Collected in Local Areas from Bhor Pune. the Plant Washed in Clear Water, Dired at Room Temp. and Then Powdered Using Motor Pestal Grinder. The Powdered Material Was Stored in an Airtight Container for Further Extraction and Formulation Studies

Methods- Soxhlet extraction method

The extract of Cynodon dactylon was prepared by Soxhlet extraction method using ethanol and water in a 70:30 ratio. About 10 g of powdered plant material

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was packed in a thimble and extracted continuously until complete extraction was achieved. The obtained extract was then concentrated and dried for further formulation studies.



Fig. no 2 Soxhlet extraction solvent evaporation

3. Phytochemical Analysis of Extract:

Sr. no	Parameter	Standard test	Method	Observation
1	Alkaloids	Dragendroff's	1ml ethanolic extract+ dragendroff's reagent	Green to precipitate
2	Tannins	Ferric chloride test	1ml extract +ferric chloride reagent	Green to red
3	Flavonoids	Alkaline reagent test	1ml extract + add NaoH then dilute	Yellow colour disappers with acid
4	Glycosides	Keller-killian test	1ml extract +glacial acetic acid+$FeCl_3$ then conc. .H_2SO_4	Brown ring at interface

Table. No.1 – phytochemical screening

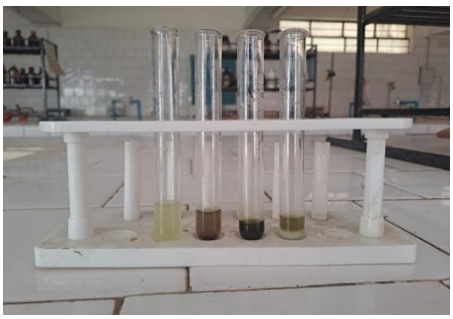


Fig.no.3- phytochemical screening test

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FORMULATION TABLE

Sr. no.	Ingredient	F1(mg)	F2(mg)	F3(mg)
1	Cynodon dactylon extract	100mg	100mg	100mg
2	HPMC (hydroxypropyl methylcellulose)	300mg	200mg	400mg
3	PVA (polyvinyl alcohol)	300mg	400mg	200mg
4	Glycerine	0.5ml	0.5ml	0.5ml
5	Propylene glycol	0.5ml	0.5ml	0.5ml
6	Ethanol	q.s	q.s	q.s

Table. No.2- Formulation Table

Preparation of Casting Solution -Transdermal patches of Cynodon dactylon were prepared by the solvent casting method. Initially, the required quantities of polymers (HPMC and PVA) were dissolved in distilled water to obtain a clear and homogeneous polymeric solution. Separately, the Cynodon dactylon extract was dissolved in ethanol and then slowly incorporated into the polymer solution with continuous stirring. A suitable amount of Glycerine was added as a plasticizer to improve the flexibility of the film, followed by the addition of oleic acid as a permeation enhancer. The resulting uniform mixture was poured into a petri dish and allowed to dry at room temperature for 24 hours. After complete drying, the formed film was carefully removed, cut into patches of desired size, and stored in an airtight container for further evaluation.

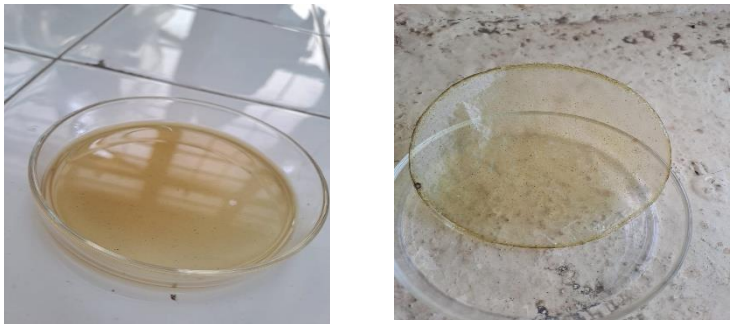


Fig.no.4- solvent casting patch drying & removing

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Pre-formulation study-

1. **Organoleptic evaluation-**



Sr.no	Parameter	Observation
1	Color	Light green
2	Odor	Characteristic herbal odor
3	Appearance	Fine powder
4	Texture	Smooth and slightly coarse
5	Taste	Slightly bitter/herbal

Table. no. 3 - Organoleptic Evaluation of Cynodon Powder

2. **Solubility study-**



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Sr.no.	Solvent	Observation
1	Water	Slightly soluble
2	Ethanol	Soluble
3	Methanol	Soluble
4	Chloroform	Insoluble

Table. No. 4 - Solubility Study

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3. **Phytochemical screening**

Sr. no	Parameter	Standard test	Method	Observation	Result
1	alkaloids	Dragendroff's	1ml ethanolic extract+dragendroff's reagent	Green to precipitate	Present +
2	Tannins	Ferric chloride test	1ml extract +ferric chloride reagent	Green to red	Present +
3	Flavonoids	Alkaline reagent test	1ml extract + add NaoH then dilute	Yellow colour disappers with acid	Present +
4	Glycosides	Keller-killian test	1ml extract +glacial acetic acid+$FeCl_3$ then conc. .H_2SO_4	Brown ring at interface	Present +

Table. No. 5- phytochemical screening test

- **Calibration curve**: A Calibration Curve Is a Graph Used in UV Spectrophotometric Analysis to Determine the Relationship Between the Concentration of Drug Solution and its Absorbance. According to Beer-Lambert's Law, Absorbance is Directly Proportional to The Concentration and Path Length of The Sample

Beer-lambert's law: A = εbc

- A – absorbance
- **ε -** molar absorptivity
- b – path length of the sample
- c – concentration of the absorbance in sample

Calibration Curve of Cynodon Dactylon – The Standard Calibration Curve of Cynodon Dactylon Extract Was Plotted as Absorbance Versus Concentration. The λ max of the Extract Was Found to Be 401nm Using UV Spectrophotometry. the Extract Showed Good Linearity Within the Selected Concentration Range 0.2 to 12 µg/ml as Shown Below

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UV analysis study of cynodon dactylon

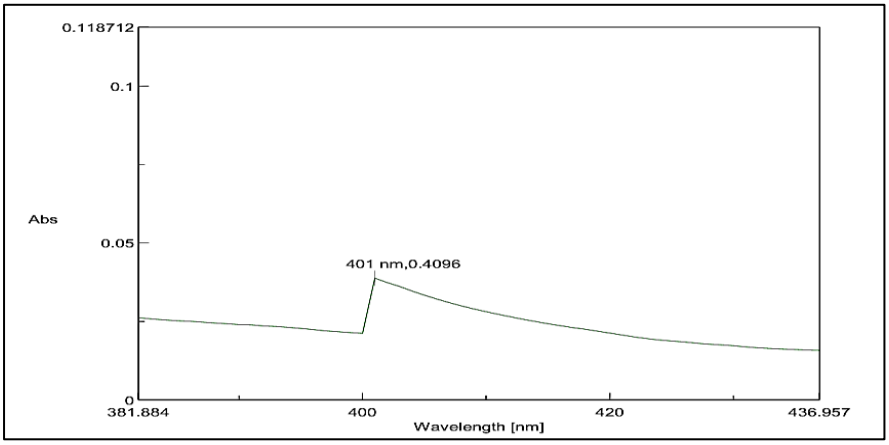


Fig. no.12- determination of λ max

Standard Calibration Curve of Cynodon Dactylon

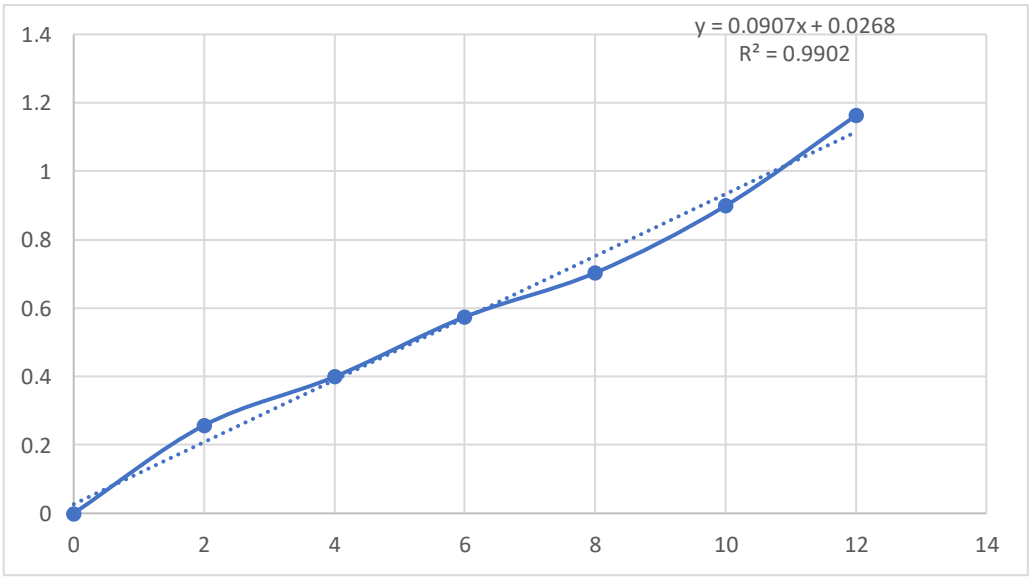


Fig. no.13 Calibration Curve

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Sr.no	Concentration (µg/ml)	Absorbance
1	0	0
2	2	0.257
3	4	0.399
4	6	0.574
5	8	0.703
6	10	0.899
7	12	1.163

Table no.9 – concentration & absorbance

Result & Discussion

❖ Evaluation parameter

A. pH: pH of the transdermal patch was determined using a calibrated pH meter. The transdermal patch cut in 4×4cm piece dissolving in 10ml distilled water. Allow the patch to swell for about 1-2hr at room temperature. switch on the calibrated pH meter it using standard buffer solution. The pH value is recorded at room temperature.

B. Folding endurance- A Patch Measuring 4×4cm Was Cut and Folded Multiple Times at the Same Point Unit It Broke. The Number of Folds Before Breaking Indicates the Folding endurance.

C. Weight variation- Initially. Selected Three Patch and Individually Weight Each Patch Using Digital Weight Machine Record The Weight of Each Patch. Calculate The Average Weight of The Patch.

D. Thickness test- The Thickness of Each Patch Was Measured Vernier Caliper. Then We Determined the Average. to Find the Weight Variation, We Weighed Three Patches and Calculated the Average Weight.

E. Moisture content – The Films Were Weighed and Placed in a Desiccator with Calcium Chloride for 24hr they were Reweighed to Calculate the Percentage of Moisture Content

$$\%\text{moisture content} = \frac{\text{initial weight} - \text{final weight}}{\text{final weight}} \times 100$$

F. Drug Content: A 2×4 cm area of the patch was dissolved in a phosphate buffer solution. The solution was stirred to dissolve the film, then transferred to a volumetric flask. The absorbance of the solution was measured at a wavelength of 247 nm to find the drug content.

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Drug content (%) = Absorbance / Total amount of drug × 100 In-vitro Study

G. Tensile strength

The patch's tensile strength was determined using a tensiometer It is made up of two grips for load cells. The lower one was fixed, while the upper one could be moved. Film strips measuring 4×4 cm were placed between the cell grips, and force was applied progressively until the film broke. The tensile strength was calculated using the dial reading in kilograms.

H. Percentage moisture uptake

The prepared transdermal films were individually weighed and stored in a desiccator containing a fused saturated solution of potassium chloride to maintain 84% RH for 24 h at room temperature. After 24 h, the films were reweighed and the percentage moisture uptake was calculated using the following formula.

$$\textbf{Percentage Moisture Uptake} = \frac{final\ weight - initial\ weight}{initial\ weight} \times 100$$

I. Swelling study

The formulated transdermal patches were weighed (W1) individually and incubated at 37±0.5 ° C separately in agar gel (2%) plate. The patches were removed from the petri dish at regular time intervals of every 15 min up to 1 h and the excess water on the surface was removed carefully with filter paper. The swollen patches were reweighed (W2) and the swelling index was calculated by using the formula.

$$\textbf{Swelling index} = \frac{w2 - w1}{w1} \times 100$$

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Evaluation parameter

Sr no.	Evaluation parameter	F1	F2	F3
1	Thickness (mm)	0.22mm	0.24mm	0.25mm
2	Weight variation (mg)	1.20mg	1.40mg	1.30mg
4	Moisture content (%)	6.66%	8.57%	7.69%
6	pH	6.75	5.75	4.91
7	Folding endurance	101	112	120

Discussion-

- The formulation and evaluation of transdermal patch of cynodon dactylon indicated satisfactory physicochemical characteristics.
- The pH of all formulation was found near the skin pH range, indicating reduced chances of skin irritation.
- Folding endurance values showed good flexibility and mechanical strength of the patches.
- The thickness of patches was uniform, suggesting proper distribution of polymer and drug throughout the formulation.
- Moisture content was found within acceptable limits, which helps to maintain stability and flexibility of the patches.
- Among formulation F3 batch showed better overall performance and was considered as the optimized formulation.

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