Formulation and Physiochemical Evaluation of Transdermal Antiacene Patch Incorporating Bioactive Rich Psidium Guajava Leaf Extract

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ABSTRACT

Transdermal patches are a non-Invasive a patient-friendly drug delivery System designed to deliver therapeutic Agents through the skin in a controlled Manner. Acne vulgaris is a common Dermatological disorder associated with Bacterial infection, inflammation, and Excessive sebum production. The present Study focuses on the formulation and Physicochemical evaluation of transdermal anti-acne patch incorporating Bioactive-rich Psidium guajava (guava) Leaf extract, known for its antimicrobial, Anti-inflammatory, and antioxidant Properties. The patches were prepared using the solvent casting method employing Hydroxypropyl methylcellulose (HPMC) and polyvinyl alcohol (PVA) as film-Forming polymers, with glycerol as a Plasticizer.

Keywords: Anti-acne patch, Psidium Guajava, transdermal drug delivery, herbal Formulation, solvent casting method physicochemical evaluation.

INTRODUCTION

Acne vulgaris is a chronic inflammatory Disorder of the pilosebaceous unit that commonly affects adolescents and young Adults. It is characterized by the formation of comedowns, papules, pustules, and Nodules due to excessive sebum Production, follicular hyper keratinization, Bacterial colonization, and inflammation. Among the microorganisms involved, Cut bacterium acnes and Staphylococcus Epidermidis play a major role in the Pathogenesis of acne by inducing inflammatory mediators and oxidative Stress in skin tissues [1], [2]. Conventional Anti-acne therapies such as topical Antibiotics, retinoids, and benzoyl peroxide are widely used but often associated with adverse effects including skin irritation, Dryness, erythema, and development of Microbial resistance upon prolonged use [3].

MATERIALS AND METHODS OF TRANSDERMAL PATCHES

GUAVA LEAF EXTRACT (Flavonoid) Active pharmaceutical ingredients.

Collection of Plant Sample: Fresh Psidium guajava (guava) leaves were collected from local regions and authenticated by a botanist From the Department of Botany. The leaves were washed thoroughly with tap water followed by distilled water to remove dust and Debris. The clean leaves were shade dried for 10–12 days and powdered using a mechanical grinder. The powdered material was stored in an airtight container for further use.

Extraction by Soxhlet Method:

Approximately 10 g of dried and powdered Psidium guajava leaves were accurately weighed and placed Inside a thimble. Ethanol and distilled water (70:30 ratio, 100 mL total) were used as extraction solvents. The solid plant material was placed in the Soxhlet thimble.

POLYMER AND EXCIPIENTS:

Table. No 1: Polymers and Excipients use for formulation:

Sr.no.	Material	Supplier
1.	HPMC	**Research lab**
2.	PVA	**Research lab**
3.	Glycerol	**Research lab**
4.	**Distilled water**	**QS**

EXPERIMENTAL WORK.

Preformulation Study:

Preformulation studies are laboratory studies to determine the characteristics of Active substance and excipients that may influence formulation and process design and Performance

Test for Tannins:

In order to observe the appearance of tannins, a ferric chloride solution + 5% ferric chloride Solution will be added drop by drop, 2-3 ml, to the solution of guava extract leaves.

Determination of Saponin: In this test 5 ml of the extract was poured into a test tube, add 5ml of water, and it was then Shaken strongly to determine the presence of saponin in the sample

Determination of Alkaloids: Two milliliters of guava were mixed with around two milliliters of 10% aqueous HCl acid. A Second 1 ml sample was treated similarly with Mayer's reagent after 1 ml had been treated With a few drops of Wagner's reagent.

Determination of Test for Steroids (Salkowski Test):This was carried out according to the method of J.B Harborne 1973. 2ml of the extract was dissolved in 2ml of chloroform. 2ml of sulfuric acid was carefully added to form the lower Layer.

Determination of ƛ max by UV-Vis Spectrophotometer:

The absorption maxima of Guava leaf extract were determined by scanning the sample drug solution Concentration in double beam UV spectrophotometer for range of 246 nm.

Calibration curve of guava leaf extract by UV-Vis is Spectrophotometric method: Calibration curve of guava leaf extract phosphate buffer pH 5.5:From the stock

solution 5ml solution was pipetted out in 100ml calibrated volumetric flask And final volume was made up to 100ml with phosphate buffer 5.5 to obtain stock solution of 5 µg/ml. concentration, from this solution 5ml, 10ml, 15ml, 20ml, 25ml was pipetted out in Different 100ml volumetric flask respectively and final volume was made up to 100ml with Phosphate buffer pH 5.5 to obtain concentration 5 µg/ml concentration, and its concentration Is determined by UVspectrophotometer at 246 nm using phosphate buffer pH 5.5 as blank.

EVALUATION TEST OF TRANSDERMAL PATCHES:

- ***Drug content uniformity***

  It is determined by taking specific no. of patches and completely dissolving then in specific media. Resulting solution is filtered out through membrane filter. The samples so obtained is analyzed by HPLC or U.V. spectrophotometer.

- ***Determination of surface***

  pH Specific number of patches are kept in contact with distilled water and excess water is drained and pH noted by pH meter

- ***Holding endurance***

  It is calculated by cutting the patch in specific size by using sharp blade. Folding endurance was determined by repeatedly following a small strip of the patch at the same place till it broke. The no. of time the patch could be folded at the same place without breaking gave the value of folding endurance.

- ***Thickness of patches***

  The thickness of transdermal patches is measured using micrometer screw gauge.

- ***Weight of patches***

  Specific number of patches of each formulation are weighed individually in digital balance and calculated standard deviation.

- ***Moisture content***

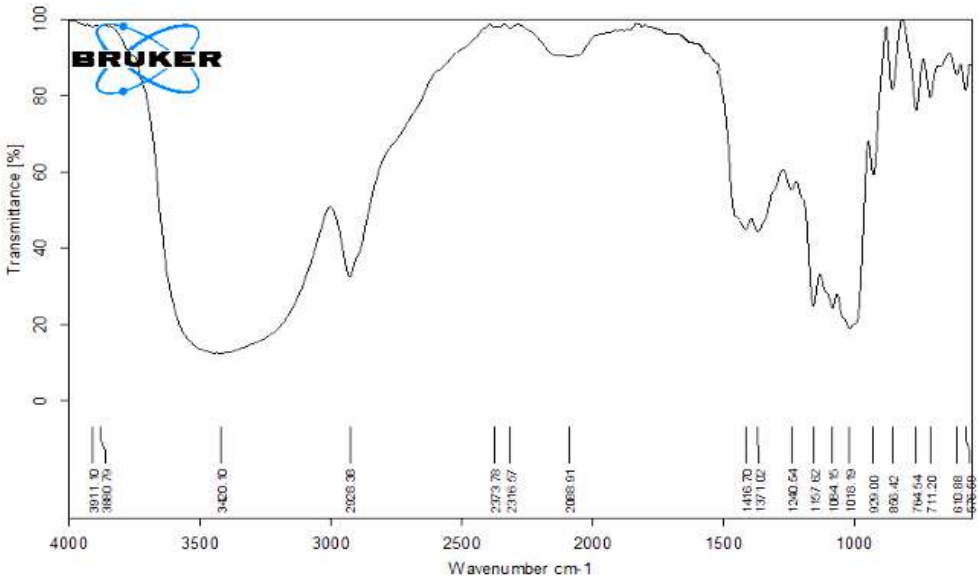
  The prepared patches are cut into strips of specific size. The strips are then weighed individually and kept in a dessicator containing activated silica at 300C for 12 hours. The films are reweighed individually until a constant weight is obtained. Percentage (%) of moisture content = Loss in wt./ Initial wt. x 100

- ***Water absorption studies***

  Transdermal films are into strips of specific size. A strip is weighed and kept in a desiccator at 400 C for 24 hours, removed and exposed to 75% RH (Containing saturated solution of sodium chloride) at room temperature weight is taken until a constant weight is obtained. Water absorption capacity = Increase in weight / Initial weight x 100.

Functional group	**Peaks Observed IR Spectrum of gu leaf extract.**
CH- Stretching	2926
CH- bending	781
C-C- Stretching	1560
N-O Stretching	1460
OH-bendig	1210
CH- bending	760
CO-O-CO – Stretching.	990

Fig .No.07.FTIR Study of Transdermal Patches Formulation



IN-VITRO DRUG DIFFUSION STUDY:

Table No.10.IN Vitro Drugs Diffusion Study Profile of Formulation F1 to F4

Time (hrs.)	F1	F2	F3	F4
0	0	0	0	0
1	6.39%	10.94 %	13.53%	6.19 %
2	12.98%	19.31%	17.60%	12.42%
3	19.39%	26.79%	26.38%	17.83%
4	27.52%	35.39%	31.12%	23.44%
5	33.14%	42.08%	31.12%	26.75%
6	46.70%	52.08%	37.63%	21.64%
7	54.06%	58.32%	50.97%	36.19%
8	68.10%	65.30%	64.58%	40.03%
9	74.20%	68.25%	70.23%	45.20%

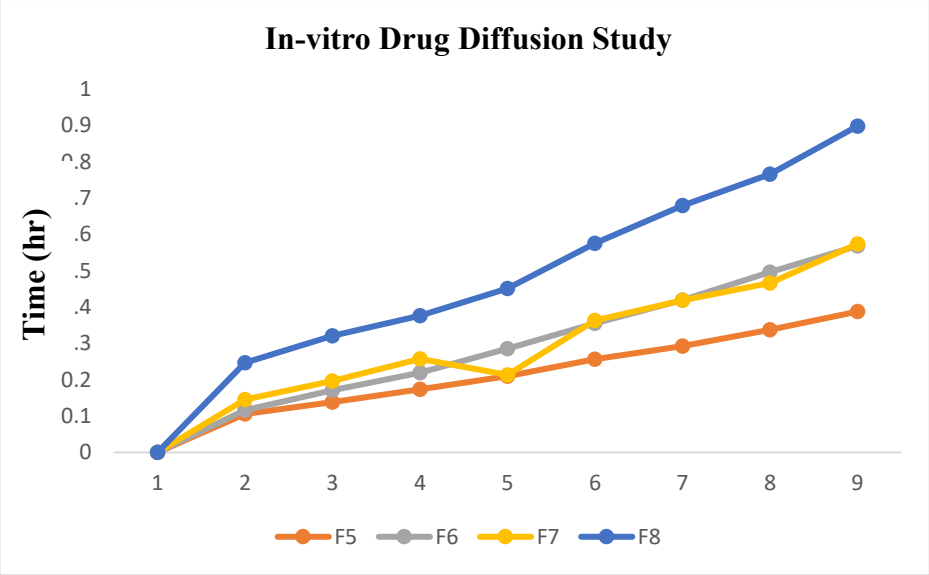


Fig.No 8. IN Vitro Drugs Diffusion Study Profile Formulation F1 to F4

Table No.11.IN vitro drugs diffusion study profile of formulation F5 to F8

Time (hr)	F5	F6	F7	F8
0	0	0	0	0
1	10.60%	11.68%	14.52%	24.72%
2	13.83%	17.14%	19.68%	30.87%
3	17.39%	21.97%	25.75%	32.09%
4	21.01%	28.56%	21.31%	37.61%
5	25.68%	35.54%	36.34%	45.12%
6	29.30%	41.94%	41.92%	57.54%
7	33.81%	49.65%	46.64%	67.94%
8	38.77%	56.86%	57.39%	76.65%
9	43.25%	60.16%	65.20%	89.86%

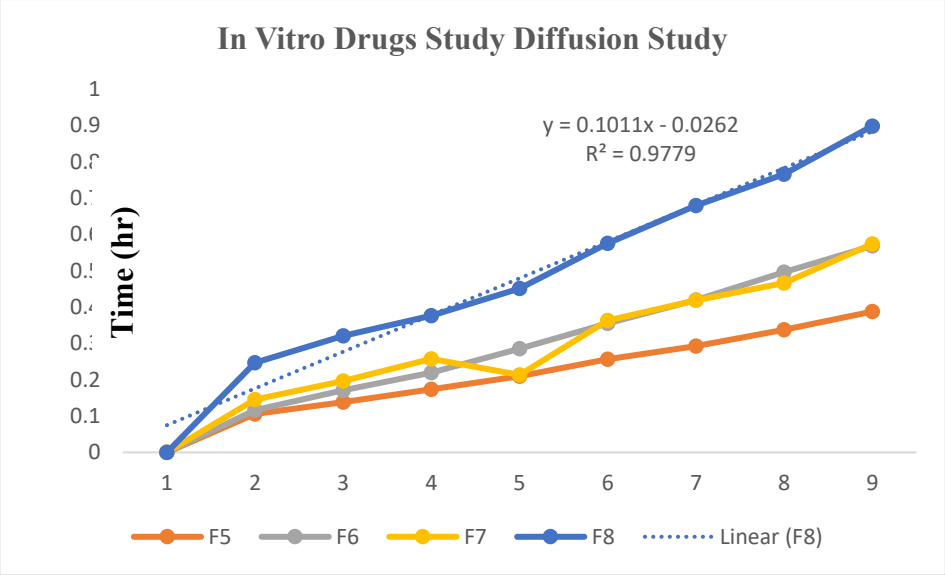


Fig.No.9.IN-vitro drugs diffusion Study profile of formulation F5 to F8.

SUMMARY AND CONCLUSION

The ultimate aim of the study was to formulate and evaluate the acne Vagaries transdermal patches of Guava leaf extract to give utilization transdermal patches technology to enhancement bioavailability of transdermal patches .The identification of drug carried out by UV spectrophotometric method and the max of the drug was found to be 246 nm. The standard calibration curve of Guava leaf extract (Flavonoids) Phosphate buffer pH 5.5 was plotted. Ten formulations of different concentration were prepared along with fix concentration of preservative then subjected to evaluation and Optimized the batch. The aim of this work was to Design, development and optimization. Transdermal patches by using casting method. In vitro release study indicated that the release of drug varied according to concentration of Polymers.

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