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Formulation and Evaluation of Transdermal Patches of Boerhaviadiffusa Linn.

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ABSTRACT
To prepare and evaluate transdermal patch of BoerhaviadiffusaLinn.(Punarnava). It has shown many therapeutic uses in traditional system of medicine, especially anti-microbial property.To convert the herbal extract into novel drug delivery system.Dried powder of leaves and roots of Boerhaviadiffusawas extracted with petroleum ether using soxhlet apparatus.Thedrug loaded transdermal patches ofherbal extract was prepared by solvent evaporation method. Five batches of BoerhaviadiffusaLinn. transdermal patches prepared were subjected to physicochemical evaluation and performed in vitro drug release studies.The formulation F5 showed maximum % Moisture uptake, Moisture content, Thickness, Folding endurance, % Drug content, Percent elongation, Tensile strength. The FTIR graphs of drug, excipients and formulations showed that there is no interactions were observed.The stability studies results showed that there is no significant change from its initial nature till the period of 3 months at 40˚C ±2˚C/75±5% RH. Thus the present work has achieved the objectives of formulation of transdermal patch of BoerhaviadiffusaLinn.using HPMC polymer.

Keywords: *Boerhaviadiffusa, Transdermal patch, HPMC*

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I. INTRODUCTION:

HISTORY OF TRADITIONAL AND HERBAL MEDICINES

Traditional system is one of the oldest systems of medicines. It is a long serving companion to humans to lead a healthy life and to fight against diseases. It has been largely transmitted orally by communities of different cultures E.g. Chinese, Indian, African system of medicines. More than 75% of world population depends on traditional medicine because of its cost and economy of the people.Herbal medicine has been a backbone for revitalizing human body systems from early stages of human history.It is becoming more main stream as improvements in analysis and quality control along with advances in clinical research and the value of herbal medicine in the treatment and prevention of disease.

Advantages

Traditional medicines are considered to be more effective than allopathic medicines for certain ailments.
Most of the ailments related to blood circulation like high blood pressure, varicose ulcers, and many others can be controlled through herbal medicines.

Disadvantages

The main disadvantage is that traditional medicines take too much time to act.
Large dose is required when compared to allopathic medicine to treat a particular disease.
Nowadays, to overcome these disadvantages the traditional medicines are formulated using novel drug delivery system.

NOVEL DRUG DELIVERY SYSTEM

NDDS is an advanced drug delivery system which improves drug potency, controls drug release to give a sustained therapeutic effect, provides greater safety and targets drug specifically to a desired tissue.
NDDS may be achieved by several systems:

Oral drug delivery systems and materials
Parenteral and implant drug delivery system
Pulmonary and nasal drug delivery
Trans- mucosal drug delivery

Transversal and transdermal drug delivery
Delivery of proteins and peptides.

PLANT PROFILE

Punarnava (Hogweed) literally means 'bring back to life' or 'renewer'.Boerhaviadiffusa belongs to plantae kingdom, nyctaginaceae family.It is a creeper that grows wild in India and Brazil throughout year but dries during the summer. It bears small fleshy leaves, small reddish pink flowers and fruits in winter.

Parts used: Whole herb, roots and seeds.

Contraindications: It is a laxative; dosage should be determined by a qualified medical professional. Children below 12 years of age and pregnant women shouldn't take this.

Medicinal Uses:

1.Punarnava is beneficial in treating obesity and ascites.

2. Punarnava is effective in treating a disease called dropsy.Figure 1: Boerhaviadiffusa

4. The roots of the plant help in killing intestinal worms.

5. When the paste made out of the roots of this plant, is applied externally on the skin, it forms a beneficial dressing for oedematous swellings, ulcers and skin diseases.

6. Treatment of anaemia, nervous weakness, paralysis, constipation and cough.

7. Studies have revealed that punarnava is an excellent diuretic, anti-inflammatory, mild laxative and is a heart tonic.

8. Punarnava has been reported to increase serum protein level mainly creatinine and reduce urinary protein extraction in clinical trials in patients suffering with nephrotic syndrome.

9. No side effects have been noted so far.

II. II.MATERIAL AND METHOD:

EXTRACTION OF LEAVES AND ROOTS OF Boerhaviadiffusialinn

The shade dried leaves and roots were subjected to size reduction and passed into sieve no 20 and then 40. About 300g of the dried powder was extracted continuously in soxhlet apparatus with petroleum ether for 24hrs to remove waxy materials then it was extracted with distilled water for 72h. After 72h the water substance was evaporated to obtainthe crude extract. Water immiscible solvent such as petroleum ether was used for the separation of alkaloid and quinine.

FORMULATION OF MEDICATED POLYMERIC FILM:

In the present study, drug loaded transdermal patches of herbal extract were prepared by solvent evaporation method. The composition is as shown in Table 1. The extract was dissolved in mixture of chloroform and methanol (1:1). To this solution accurately weighed HPMC-K15M was added in different ratio and stirred continuously with the help of magnetic stirrer to get uniform solution. To this solution, 2 % of poly ethylene glycol (plasticizer) wasadded and stirred well to get a homogenous solution. DMSO is added as penetration enhancer. The solutions was poured on glass petriplate and allowed to dry. After 24 h 2 cm diameter (3.14 cm2) patch were cut and properly stored.

Table I: COMPOSITION OF TRANSDERMAL PATCH

F. Code	*HPMC K-15 gram*	*PEG %w/w*	*DMSO %w/w*	*Extract Mg*	*CHCl3:CH3OH*
F1	1	2	5	50	1:1
F2	1.2	2	5	50	1:1
F3	1.3	2	5	50	1:1
F4	1.4	2	5	50	1:1
F5	1.5	2	5	50	1:1

III. RESULT AND DISCUSSION:

Transdermal drug delivery system of Boerhaviadiffusawas developed using polymers like HPMC k 15, and employing poly ethylene glycol as plasticizer and DMSO as the permeation enhancer. The patches formulated were subjected to physicochemical evaluation such as physical appearance, weight variation, thickness, % moisture content, % moisture uptake, tensile strength, hardness and drug content. The in vitro drug release studies across cellulose were evaluated.

Evaluation of transdermal patch

Table Ⅱ: Thickness, Uniformity of weight and Folding endurance of patches

F. Code	*Thickness(mm)*	*Uniformity of weight(mg)*	*Folding endurance*
F1	0.154±0.0547	40±5.2	24±1
F2	0.182±0.0130	38±3.6	23±1
F3	0.195±0.053	38±2.6	25±1
F4	0.187±0.063	37±3.5	27±1
F5	0.236±0.057	43±2.7	28±1
Mean	0.190±0.0481	40±3.8	25.4±1

Table Ⅲ: Flatness, % Moisture content, % Moisture uptake and % Drug content

F. Code	*Flatness %*	*Moisture content %*	*% Moisture uptake*	*Drug content (%)*
F1	100	2.01±0.07	2.25±1.03	89.16
F2	100	2.44±0.03	1.95±0.44	92.5
F3	100	2.27±0.07	2.35±0.33	90.4
F4	100	1.85±0.02	2.18±0.55	91.43
F5	100	1.74±0.03	2.56±0.88	94.56
Mean	100	2.16±0.04	2.25±0.55	91.61

Table Ⅳ: Invitro drug release

Formulation	*0hr*	*0.5hrs*	*1hrs*	*2hrs*	*4hrs*	*6hrs*	*8hrs*	*12hrs*	*16hrs*	*24hrs*
F1	0	0.13	1.87	4.3	12.5	26.73	34.5	45.6	58.43	67.7
F2	0	1.46	2.53	8.54	18.56	40.56	42.41	57.36	68.55	74.53
F3	0	0.38	2.85	14.36	26.86	38.26	48.8	52.3	72.13	82.4
F4	0	0.51	1.9	5.83	14.56	21.46	28.56	38.53	55.43	64.34
F5	0	0.19	2.35	9.65	17.9	27.46	31.53	54.43	68.83	80.56

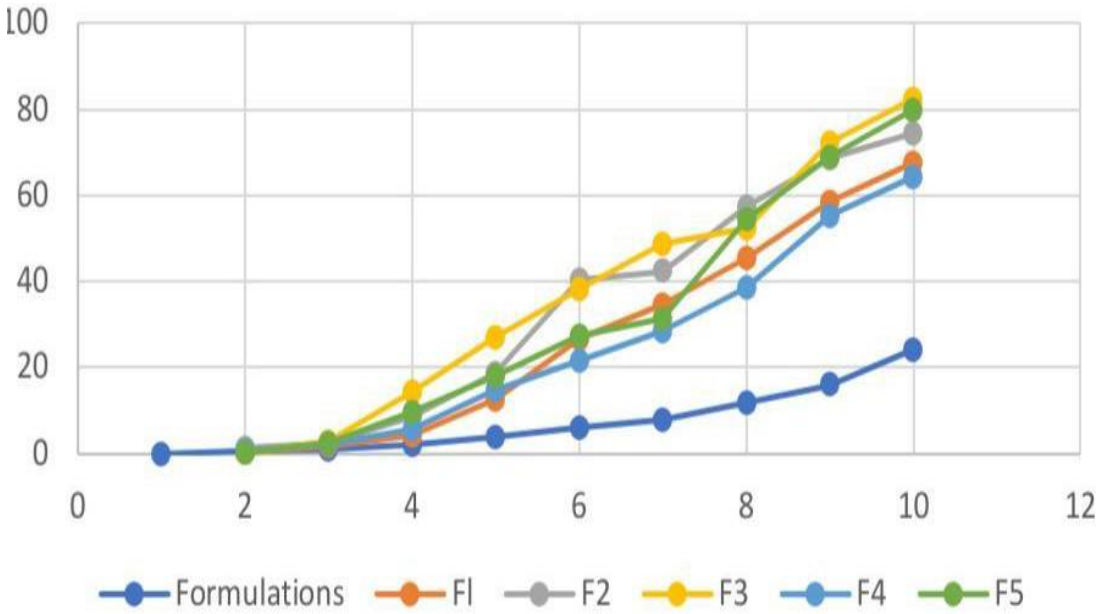

Figure 2: GRAPH OF INVITRO DRUG RELEASE

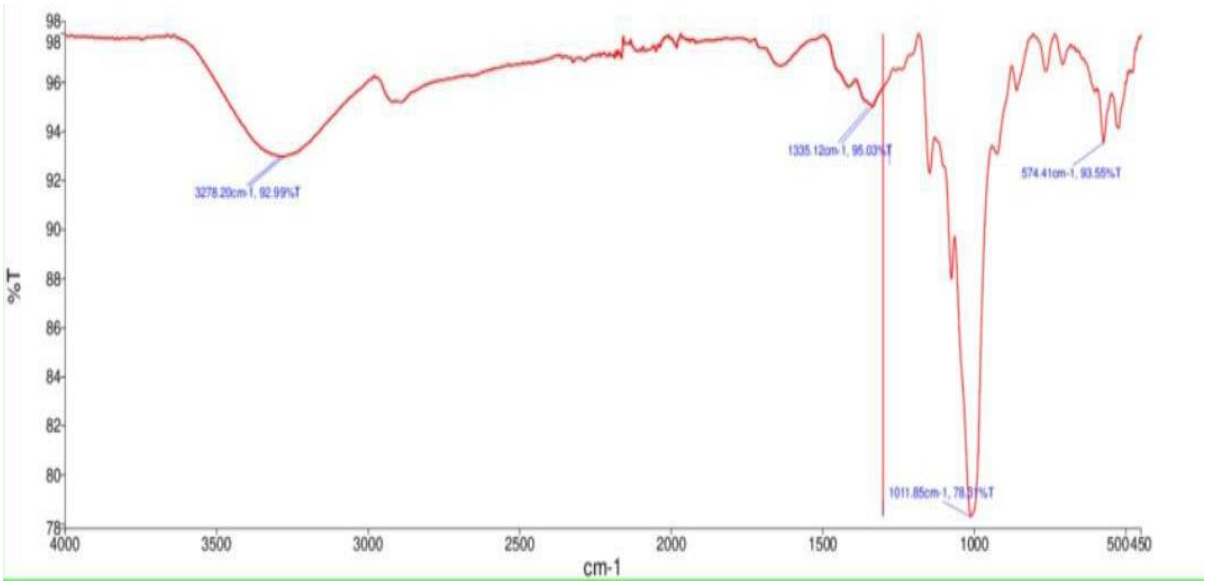

Figure 3: FTIR OF Boerhaviadiffusa Linn.

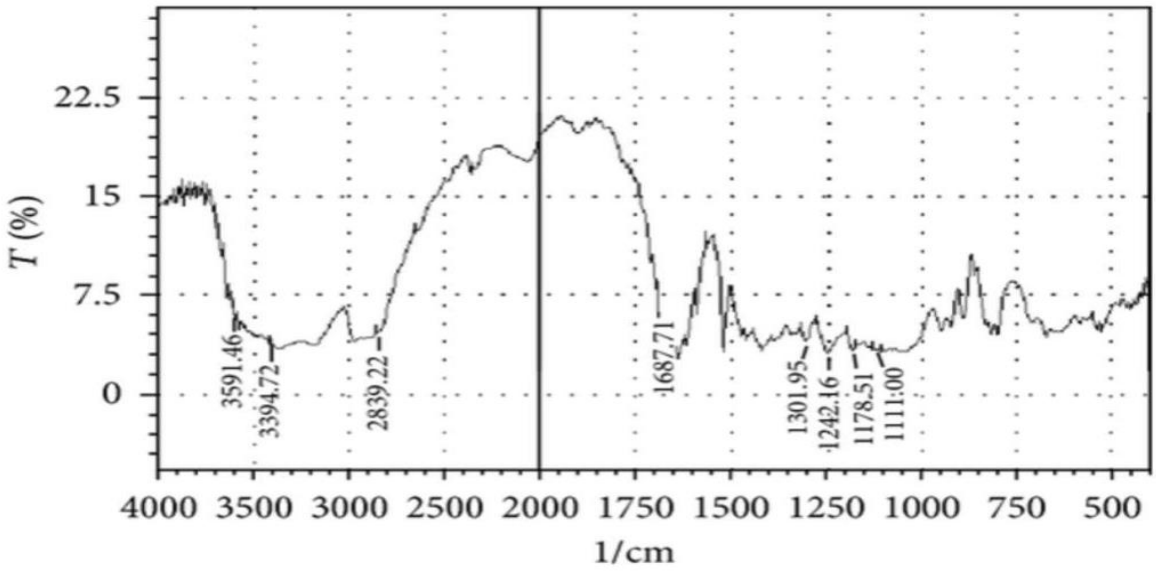

Figure 4: FTIR OF HYDROXY PROPYL METHYL CELLULOSE K 15

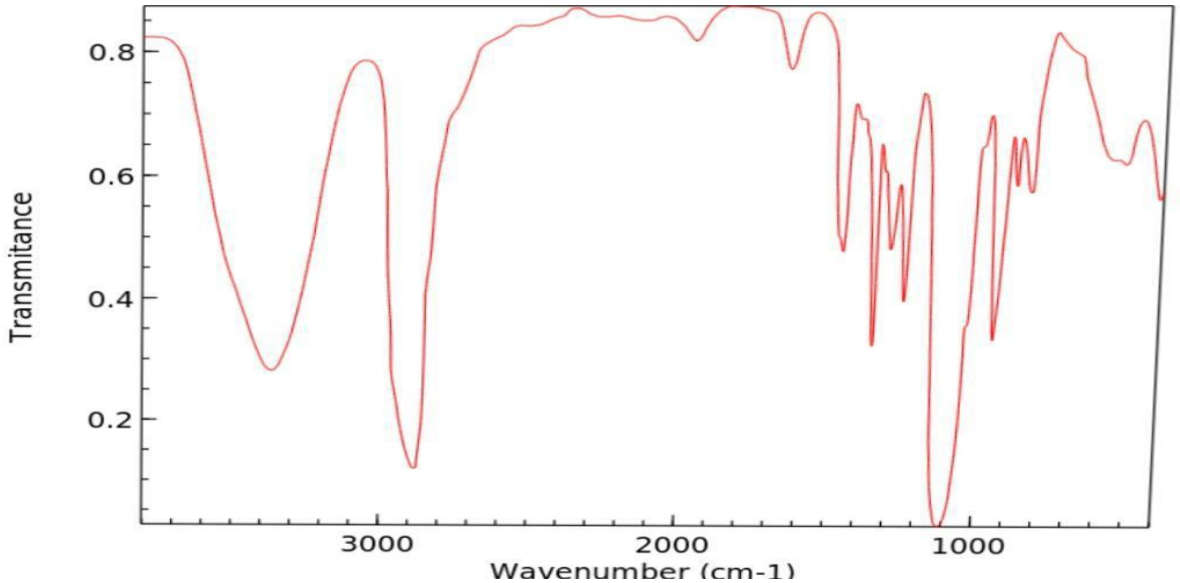

Figure 5: FTIR OF POLY ETHYLENE GLYCOL

IV. SUMMARY AND CONCLUSION:

Five batches of Boerhaviadiffusa transdermal patches were prepared by solvent evaporation technique.The various formulation parameters, drug-polymer ratios and permeation enhancers were optimized to get thin, transparent, smooth, stable and high permeable transdermal patches. The FTIR graphs of drug, excipients and formulations showed that there is no broadening of peaks were observed and thus it indicates that there is no incompatibility between drug and excipients. From the optimization, best formulation F5 was selected based on physicochemical evaluation and in vitro drug diffusion study.Poly Ethylene Glycol was added as plasticizer to produce a flexible patch without having major influence on their diffusion property.

The plasticizer diffuses through the patch and softens the polymer particles. This softening promotes latex coalescence and patch formation. The formulationF5 showed maximum % Moisture uptake, Moisture content, Thickness, folding endurance, % Drug content, Percent elongation and Tensile strength. No significant difference in drug content was observed between the patches among the five formulations. This indicates the homogenous dispersing of drug during the patch preparation. The accelerated stability studies results showed that there is no significant change from its initial nature till the period of three months at 40˚C ±2˚C/75 5% RH. The present work has achieved the objectives of formulation of transdermal patch of Boerhaviadiffusa by using HPMC K 15 polymer.

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