Review Article

SGVU Journal of Pharmaceutical Research & Education

ISSN: 2456-4508

JPRE

Journal homepage: http://www.gyanvihar.org/researchjournals/

Formulation and Evaluation of Transdermal patches with *Fernandoa Adenophylla* Extract as a possible treatment for psoriasis

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ABSTRACT:

Synthetic drugs are often used to treat various disorders and may be used topically in the form of patches. In recent decades, there has been a revival of the old medical system. Thus, several illnesses may be treated using herbal drugs applied externally. Fernandoa adenophylla has a range of pharmacological properties, including muscle relaxant, antibacterial, antifungal, anti-inflammatory, and antimicrobial effects. Katsagon, also known as Fernandoa Adenophylla, is a very utilitarian plant. This study aimed to isolate Fernandoa adenophylla, create an extract, and evaluate its effectiveness as a transdermal patch. We assessed the physical characteristics, weight changes, thickness, folding strength, moisture absorption rate, and surface pH of the transdermal patches produced by the solvent casting method. The infrared spectroscopy findings verified the compatibility of the medicine and polymer. The results suggest that the formulated medication will be significant in the future management of psoriasis.

KEYWORDS: Fernandoa Adenophylla, transdermal patches, Anti-inflammatory activity.

Introduction

Medicine from the past has been used for many generations to help people stay healthy and fight illness. Traditional medicine has been used by indigenous people for thousands of years. The Chinese, Indian, and African methods are some of the most well-known. (1)

Transdermal patches are self-contained dose forms that work by releasing drugs through the skin at a controlled rate to have effects throughout the body. When compared to oral treatment, they have many advantages, such as avoiding first-pass liver metabolism, food interactions, and stomach side effects, and giving a regular dose with steady bloodstream levels. The transdermal way is better because it keeps plasma levels steady for longer periods of time, so doses don't have to be taken as often. Several transdermal systems have been made for direct application to provide constant medicine absorption through undamaged skin. These systems control how the drug is distributed and how deeply it penetrates into the skin tissue. TDDS has slowly gotten better by solving skin barrier qualities, reducing skin itching, and making the future look brighter for passive patch systems. TDDS is a self-contained, separate dosage form that is put on healthy skin to safely deliver medicine to the body's blood. Transdermal medicine delivery through the skin can be used for a number of medical conditions. A pharmaceutical expert has been working on skin medicine delivery for the past 25 years. The skin is a big, easy-to-reach area that can be used to deliver drugs.(2)(3)

Transdermal patches are used a lot in the pharmaceutical industry, both for study and to come up with new ways to give drugs. (4). Not many people use transdermal patches to take plant medicines. Herbal drugs or plant-based active ingredients can be hard to put on the skin because of things like unstable acidic pH, liver metabolism, food interactions, and poor absorption, all of which can make these medicines less bioavailable when taken by mouth. Different kinds of extracts can be put on the skin using transdermal patches. These include dry extracts of specific herbs like ginger (5), tamarind (6), soy (7), dry polyherbal extracts (8)(9), lipophilic extracts such as ginger (10) or Curcuma longa (11), and fluid extracts of green tee (12) or Momordica charantia (13).

This plant, Fernandoa Adenophylla, is in the Bignoniaceae family and can be found in Africa and Southeast Asia.(14)Fernandoa is a genus with 15 species, most of which live in the tropical areas of the Old World. Only one species of the genus lives in India. It is called Fernandoa Adenophylla.(15)It is located in the woods of Maharashtra, Gujarat, Rajasthan, and Assam in India.Fernandoa Adenophylla, also known as Ziron, Lotum-poh, Dhopa-phali,

Mostan-phul, and Karen wood, is a plant belonging to the Bignoniaceae family. It has been historically utilized for snakebites in the Morigaon district of Assam, India, for skin disorders in Thai traditional medicine, and for treating haemorrhoids and constipation in the Chakma tribe of Bangladesh.(16)

Heterophragmaadenophyllum's spatial part is very important for keeping people healthy and healing many illnesses. In traditional medicine, the leaves are put on the face to treat skin problems. The tree is used a lot in traditional healing. It is a tree that is grown for its looks and is also used in massage oils to ease muscle strain. Katsagon is the name for the soft wood from Burma that is used to make bows and furniture. People have used the roots of Heterophragmaadenophyllum for a long time to treat piles, constipation, and even snake bites.(17)(18)(19)Some of the powerful phytochemicals found in Fernandoa Adenophylla are naphthoquinones and their derivatives (peshwaraquinone, dilapachone, adenophyllone, indadone, and lapachol), as well as triterpenoids (ursolic acid, β-sitosterol, α-amyrin, and oleanolic acid). These chemicals have been studied and found to possibly have medical effects. Researchers have looked into the medicinal qualities of Fernandoa Adenophylla's raw extract. These properties include anti-inflammatory, antibacterial, antifungal, anti-TB, hypertension, and leishmanicidal effects. (16)Different experts have made a number of skin patches that allow controlled release over a long period of time. As a result, we should choose an ayurveda plant medicine that is safe, effective, and well-known. This is what our study is mostly about. The goal of this study is to find out how to extract, make, and test plant transdermal patches of Fernandoa Adenophylla using polymer as a possible future treatment for psoriasis.

MATERIALS AND METHODS:

Materials:

Fernandoa Adenophylla (Katsagon, Marodphali) leaves, barks and fruits were collected from the local area of Saket, New-Delhi, India. All the parts were cleaned and shade dried at room temperature. The excipients as polymer polyvinyl alcohol (PVA), Polyvinyl Pyrrolidone (PVP), Methanol, Propylene glycol, glycerol and polyethylene Glycol 400 used were of analytical grade.

Methods:

Extraction of leaves, barks and fruits of *Fernandoa Adenophylla*

The leaves, barks, and fruits that had been dried in the shade were shrunk. The crude extract was obtained by continuously extracting 300 g of the dried powder with methanol for 12 hours in a Soxhlet system. The solvent was evaporated in a vacuum oven..(20)(21)

Figure 1: Extraction of leaves, bark and fruits by Soxhlet apparatus

Compatibility studies by FTIR

Infrared spectroscopy is generally used for qualitative identification of substances in pure or mixed forms, as well as structural determination. Because I.R. is associated with covalent bonding, the spectra may offer exact information about the structure of molecular compounds. To prove this point, comparisons were made between the material's spectrum and that of the pure chemical. Infrared data is important for validating the drug's identification and discovering drug-polymer interactions. The infrared spectra of the medicine and polymer were measured individually and in physical mixtures. Then, any possible interactions between the polymer and the drug were investigated. (22)

Method of Preparation

Patches were made using the solvent casting procedure. PVA (1 g) and PVP (1 g) were weighed in the proper ratios and blended in 10 mL of distilled water, which was then agitated until thoroughly dissolved over a hot bath. After the liquid has cooled to 25°C, add the extract (10 g), propylene glycol (0.5 ml), and glycerol (0.5 ml) and mix for 15 minutes under closed circumstances with a mechanical stirrer at 800 rpm. PEG 400 (46% w/w of polymers) was used as a plasticizer. Oleic acid was used as a pharmaceutical solvent and permeation enhancer (12% w/w polymers). A predefined amount of polymeric solution containing drug

and plasticizer was poured onto a glass Petri plate, which was then dried for 24 hours with a funnel over it. The films were taken from the Petri dish using a sharp blade along their edges and placed in desiccators. (23) (24)

Figure 2: Formulated Transdermal Patch

Evaluations

Physical Appearance:

Colour, clarity, flexibility, and smoothness of all transdermal patches were visually evaluated.

Uniformity of weight:

The determination of the average weight was achieved by randomly weighing four different patches and then computing the average weight. The examinations were performed on a patch that had been dried at a temperature of sixty degrees Celsius for a period of four hours.

Figure 3: Evaluation of Transdermal Patch

Thickness of the Patch:

The patches' thicknesses were measured with a digital Vernier calliper at various spots on the patch. Three patches were chosen at random from each formulation. The thickness of a single patch was measured and the average value was found.

Percentage Moisture uptake:

After precise weighing, the patches were put in desiccators that contained aluminum chloride. It was necessary to remove and weigh the patches after 24 hours. The moisture absorption % was determined by subtracting the starting weight from the end weight. The following formula was used to determine it.

Percentage moisture uptake = [Final weight -Initial weight/Initial weight] ×100 .(25)(26)

Folding Endurance:

A little (2x2 cm) piece of film folded in the same spot several times until it breaks will give you the answer. In terms of folding endurance, the value represents the number of times the film could be folded in the same spot without breaking.(27)

Determination of surface pH:

The patches were allowed to swell by keeping them in contact with 5ml of distilled water for 2 hr at room temperature and pH was noted down by bringing the electrode in contact with the surface of the patches, allowing it to equilibrate for 1 min.(28)

RESULTS AND DISCUSSION:

Compatibility studies by FTIR spectroscopy:

There was no appearance of any characteristic peaks which shows that there was no chemical interaction between the drug and polymer used. Hence the IR spectrums not show anyincompatibility between the polymers and drug extract as shown in figures from figure 4 to 11.

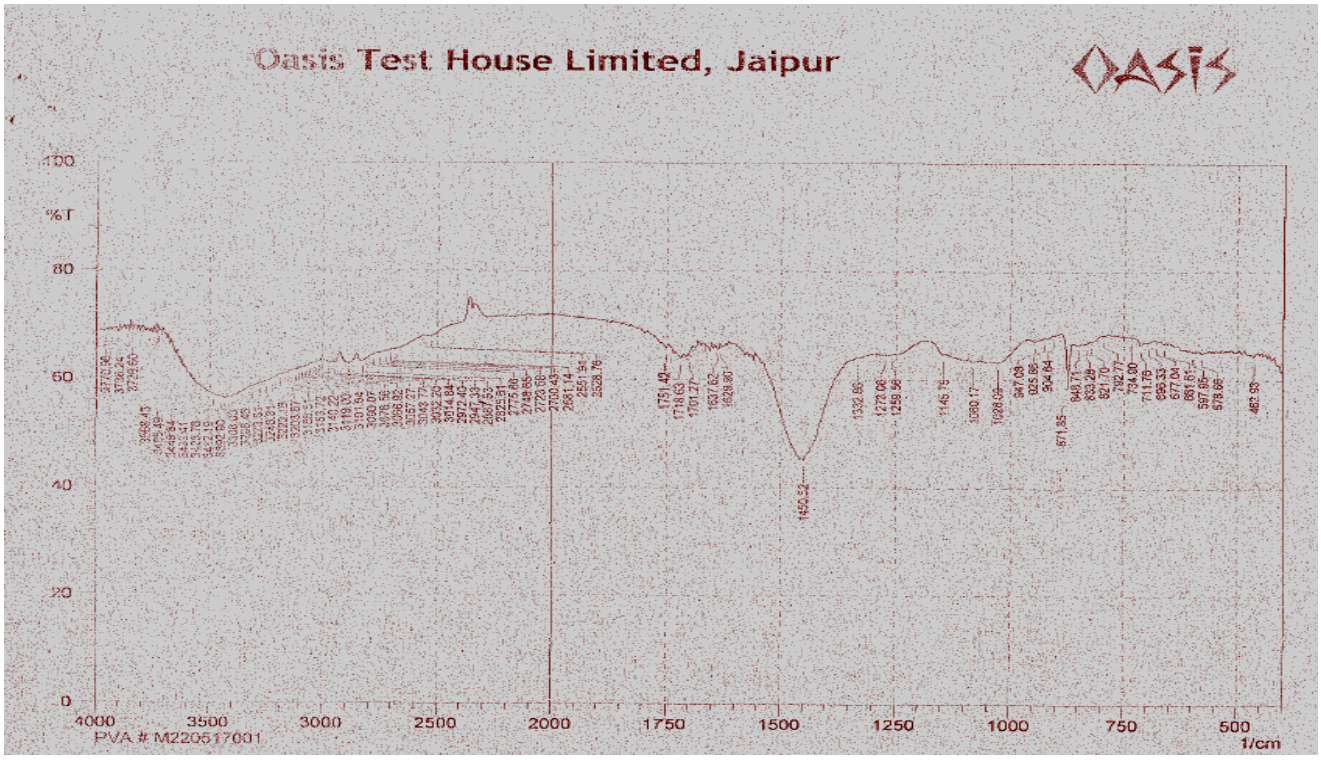

Figure 4: FTIR spectra of PVA

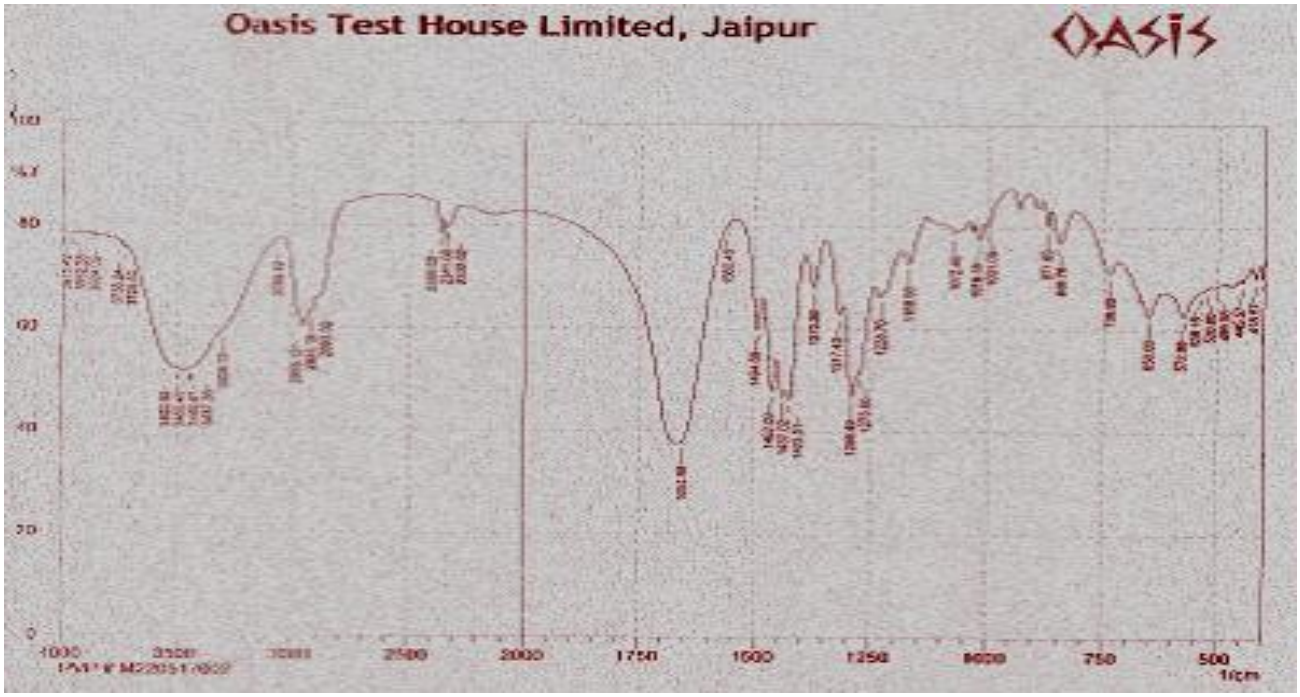

Figure 5: FTIR spectra of PVP

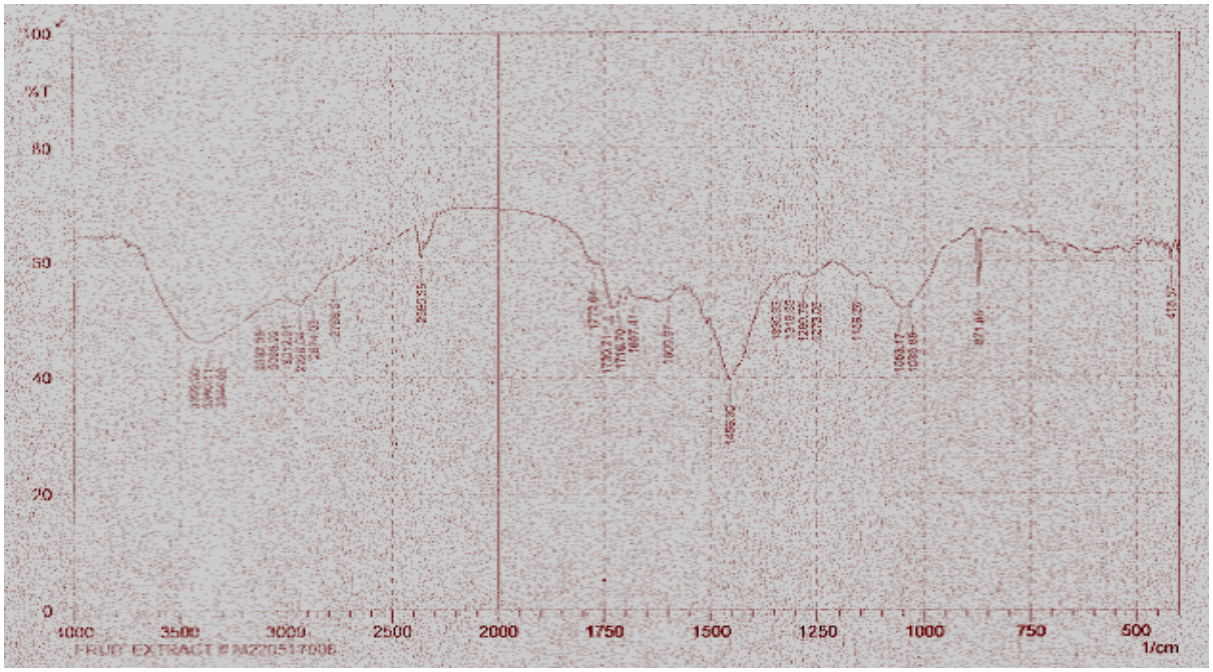

Figure 6: FTIR spectra of Fruit extract (FE)

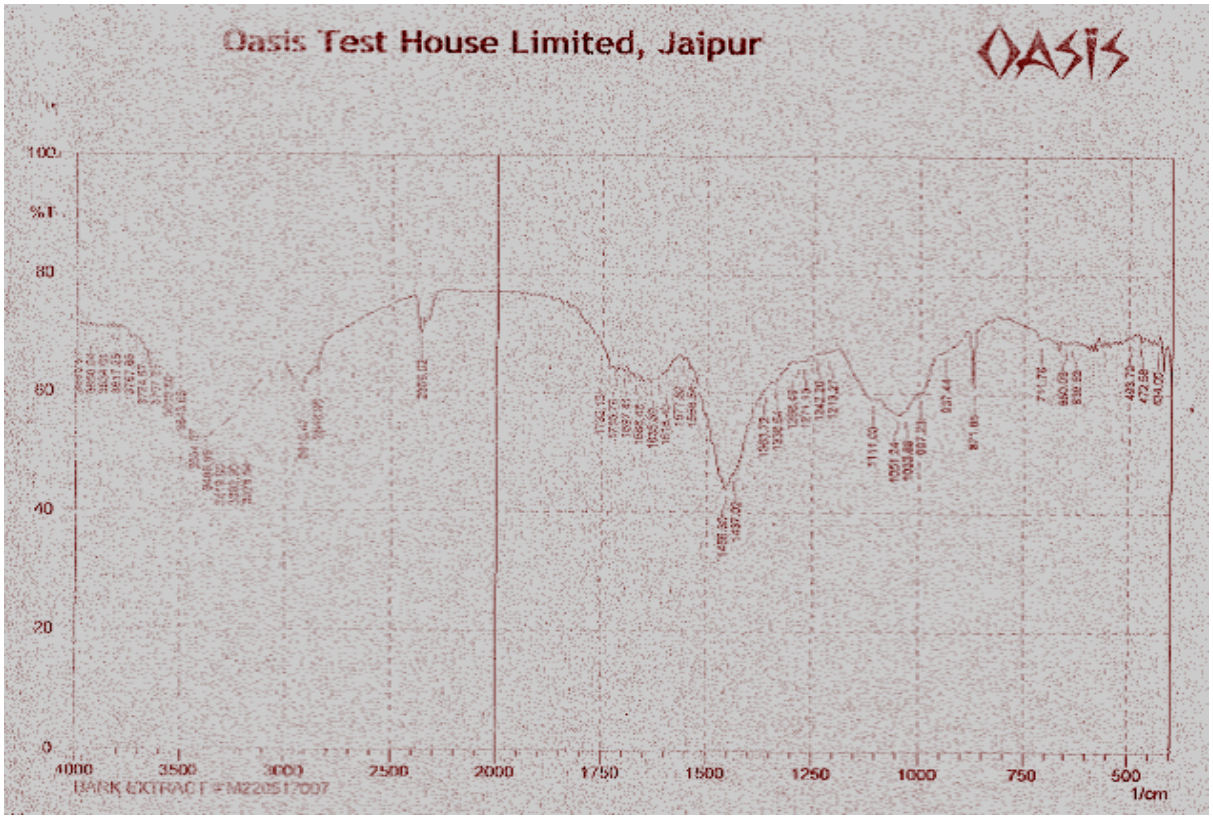

Figure 7: FTIR spectra of Bark extract (BE)

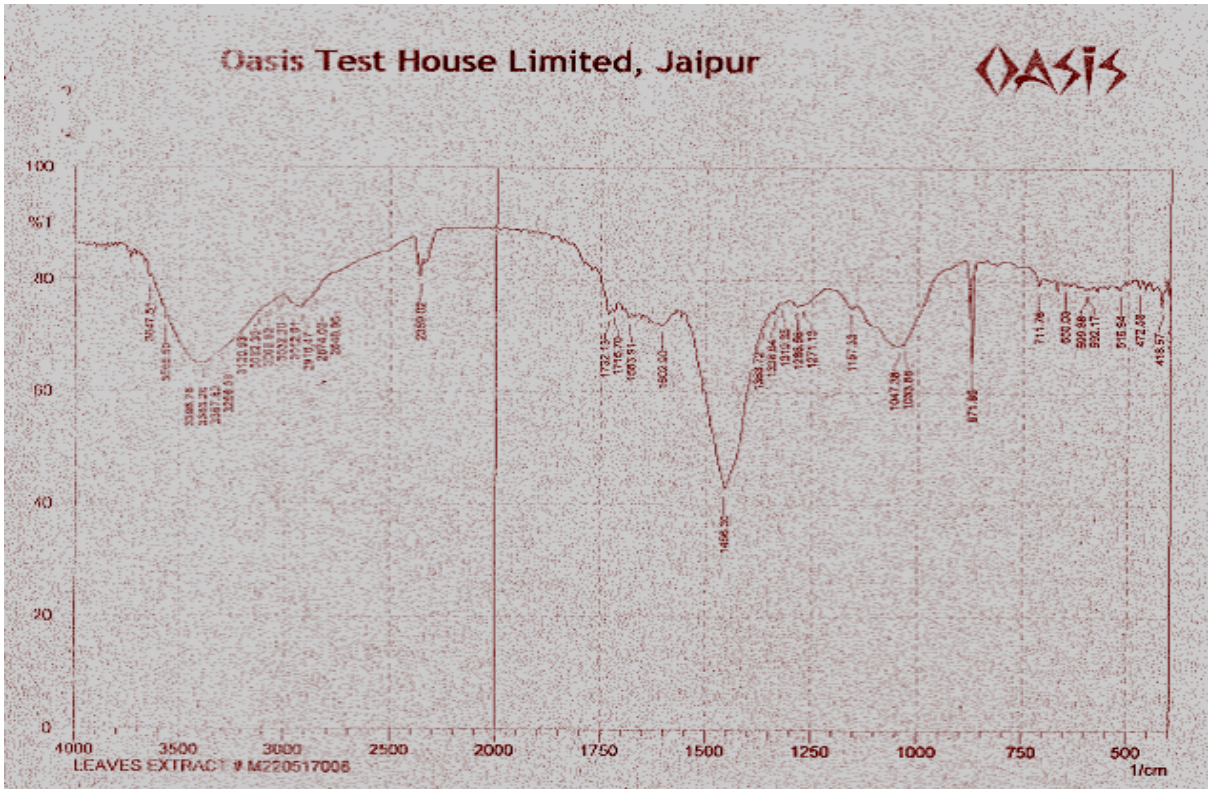

Figure 8: FTIR spectra of Leaves extract (LE)

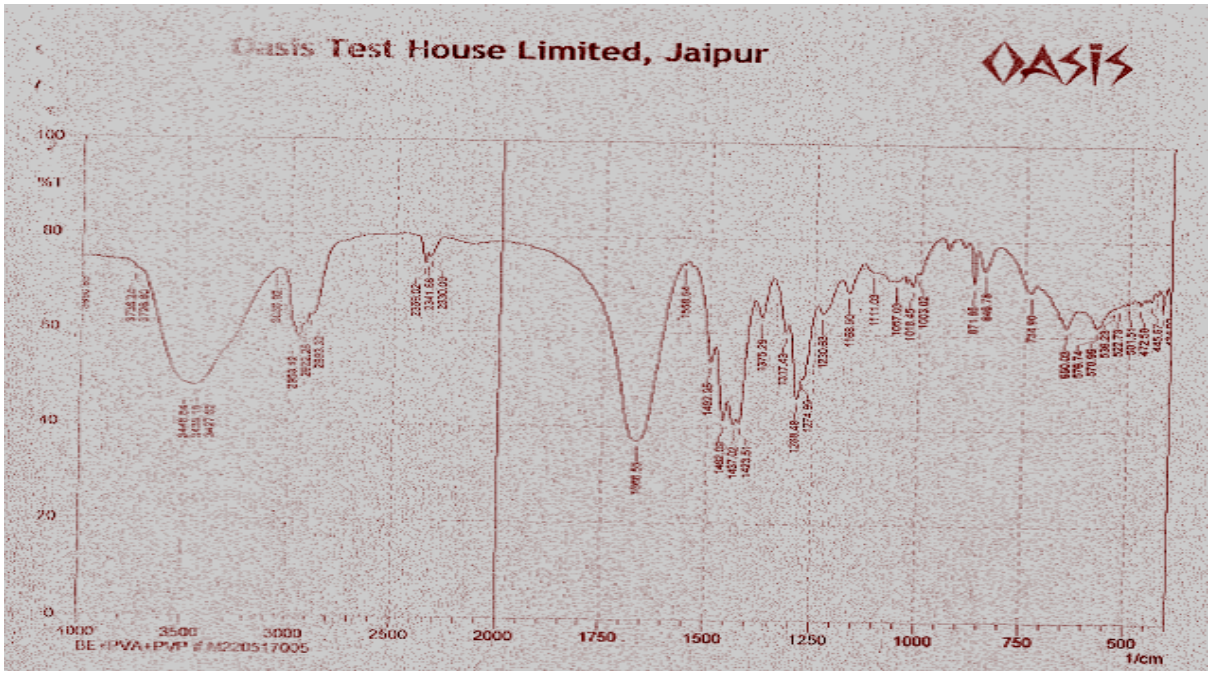

Figure 9: FTIR spectra of BE+PVA+PVP

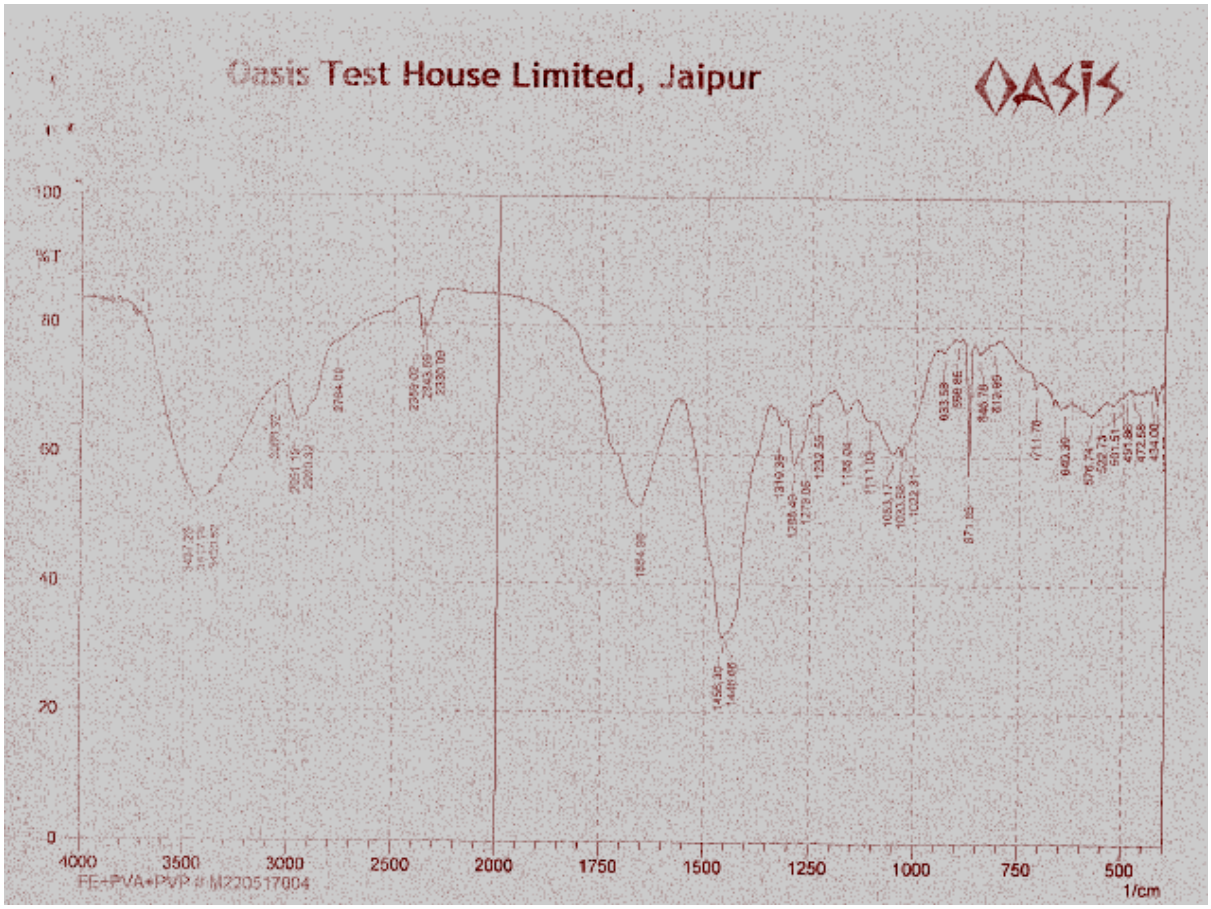

Figure 10: FTIR spectra of FE+PVA+PVP

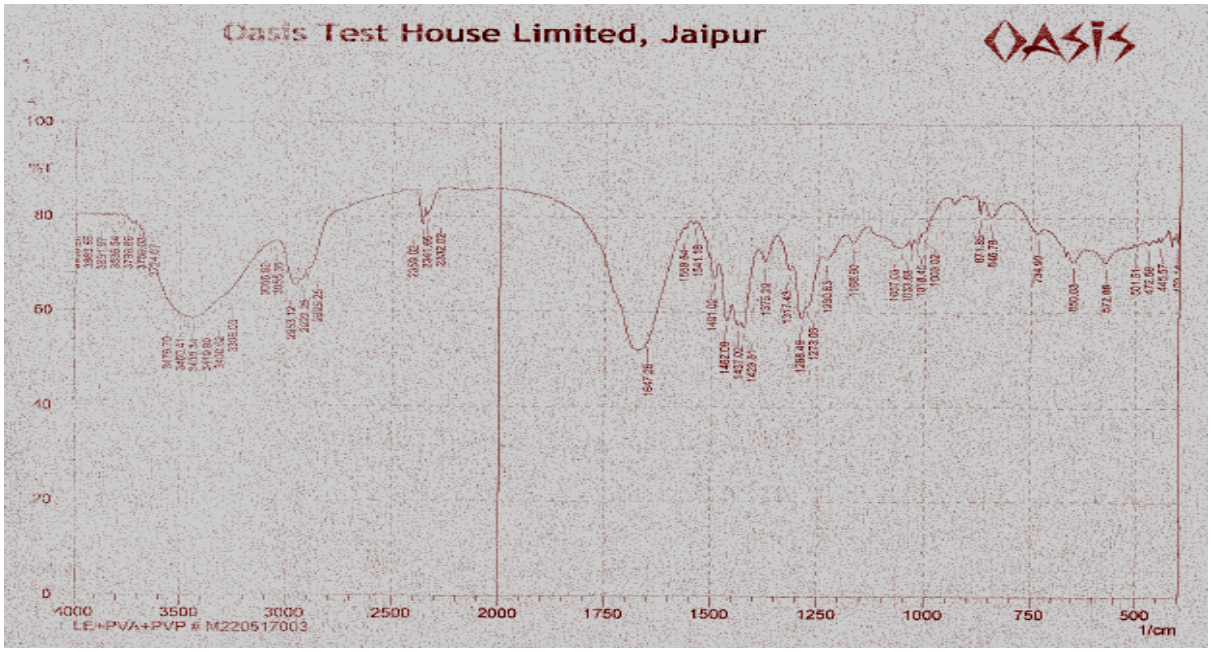

Figure 11: FTIR spectra of LE+PVA+PVP

Evaluation

Physical Appearance:

The patches were found to be smooth with elegant appearance. Colour: Muddy Green, Yellow, Odour: Odourless.

Uniformity of weight:

The weights of the patches are in between 1.55±0.014gm to 1.60±0.084gm. The patches exhibited uniform weight and there was no deviation in the weight.

Thickness of the Patch:

The results of thickness of the patches are in between 0.100±0.007mm, which indicates that low standard deviation in different patch thickness is relatively similar. The results indicated that there was no much difference in the thickness.

Percentage Moisture uptake:

The percentage moisture uptake results were in between 1.63±0.058 and 1.67±0.043. The results show that moisture absorption of all patches is within limits.

Folding Endurance:

Patches are evaluated based on their capacity to endure rupture, which is measured by folding endurance. The findings suggested that the patches would not break and had strong mechanical strength coupled with flexibility. Their integrity would be maintained with general skin folding when they were utilized. The results were in the range of 155±4 to 160±2.

Determination of surface pH:

The pH of patches was determined using digital pH meter. The pH is also an important characteristic of patches so as to match the pH of skin and should not irritate when applied. The results are shown ranging from 6.2±0.19 to 6.4±0.13.

CONCLUSION:

In order to effectively create transdermal patches of Fernandoa adenophylla (methanolic extract), the solvent casting technique was used, and both PVA and PVP were utilized. There

were no significant medication interactions that were discovered by the FTIR investigations. Good results were obtained for a variety of assessment criteria when the patches were created.

ACKNOWLEDGEMENTS:

Authors wish to give thanks to Management of Suresh gyanvihar University for providing suitable research facilities.

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