Formulation and Evaluation of Herbal Anti-Diabetic patch

*Miss. Bhakti R. Gadekar[1], Miss. Geeta N. Sapkale[2]

[2]Associate Professor, ASPM's K. T. Patil College of Pharmacy Osmanabad- 413501 Maharashtra

[1]Student, ASPM's K. T. Patil College of Pharmacy Osmanabad- 413501 Maharashtra

ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by a high blood glucose level caused by insulin deficiency. For the treatment of diabetes these herbal patches are used. The polymers that were used for selected sustain release of drug are methylcellulose and polyetheleneglycol used as plastisizer. Transdermal patches of herbal extracts of Azadriachata indica and Momordica charantia were prepared by solvent casting method.The patches were optimized on the basis of physiochemical evaluation such as thickness, folding endurance, physical appearance, uniformity of weight, moisture content and moisture uptake studies. The patches prepared using 30% w/v of plastisizer showed the higher drug release from the herbal transdermal patch than the 20 and 25% w/v during in vitro studies in 24 hrs

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by a high blood glucose concentration (hyperglycemia) caused by insulin deficiency and it is often combined with insulin resistance. Non-insulin dependent diabetes mellitus (NIDDM) represents a heterogeneous group comprising milder form of diabetes that occurs predominately in adults and vast majority of diabetic patients have NIDDM. The conventional drug treatment of diabetes mellitus consists of oral hypoglycemic agents like sulfonylureas, biguanid'sα-glycosidase inhibitorand thiazolidinediones which have side effects. An important problem in the drug therapy is the lack of patient compliance Transdermal drug delivery system (TDDS) thus offers a better route of delivery, reported to have better patient compliance

Transdermal drug administration topical generally refers to application of agents to healthy intact skin either for localized treatment of tissues underlying the skin or for systemic therapy For transdermal products the goal of dosage design is to maximize the flux through the skin into the systemic circulation and simultaneously minimize the retention and metabolism of the drug in the skin TDDS can deliver certain medication to systemic circulation in a more convenient and effective way than is possible with conventional dosage form. The potential of skin as a path of drug

administration has been amply demonstrated by the acceptability of marketed therapeutic systems. TDDS can minimize first-pass metabolism associated with gastro-intestinal administration of drugs. The TDDS can maintain constant drug level in blood. The definition of controlled release is a technique in which active chemicals are made available to a specified target at a rate and duration designed to accomplish an intended effect. At present, synthetic drugs form a major line of the treatment in the management of diabetes and few synthetic pharmacologically active substances can currently be administered through transdermal patches and production is technically demanding delivery system is a challenging the development and optimization of dermatological task in respect to herbal drugs and research is ongoing to improve the systems and expand the indications. Transdermal drug delivary system are defined as self-contained discrete dosage forms which applied to skin, deliver the drug through the skin at controlled rate to the systemic circulation. A transtdermal drug delivary is a formulation or device that maintains the blood concentration of the drug with in therapeutic system window ensuring that drug levels neither fall below the minimum effective concentration nor exceed the minimum toxic dose.

Fig.No.1 – Patches (transdermal)

ANATOMY OF SKIN

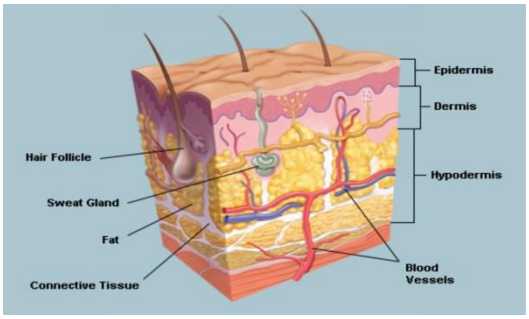

Fig. Histology of skin

"Skin has three layers: The epidermis, the outermost layer of skin, provides a waterproof barrier and creates our skin tone. The dermis, beneath the epidermis, contains tough connective tissue, hair follicles and sweat glands. The deeper subcutaneous tissue (hypodermis) is made of fats and connective tissue.''

The layers of skin:-

There are three main layers of skin.

- Epidermis is the top layer of skin, the part of the skin you see.
- Dermis is the 2nd layer of skin. It is much thicker and does a lot for your body.
- Subcutaneous fat is the bottom layer.

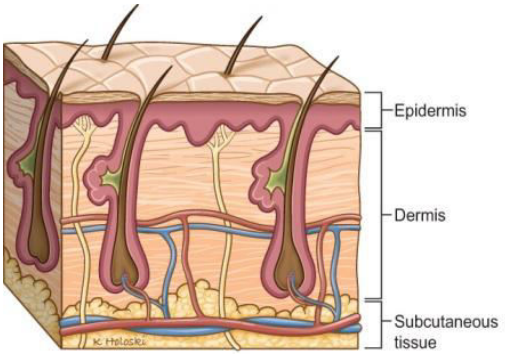

Fig.3. layers of skin

Skin permeation: - Until the last century the skin was supposed to be impermeable with exception to gases. However, in the current century the study indicated the permeability to lipid soluble drugs like electrolytes.

A. Stratum Corneum as Skin Permeation Barrier

The average human skin contains 40-70 hair follicles and 200-250 sweat ducts per square centimeter. Especially water-soluble substances pass faster through these ducts; still these ducts don't contribute much for skin permeation. Therefore most neutral molecules pass through stratum corneum by passive diffusion. Thus, the stratum corneum acts as a passive, but not inert, diffusion medium.

Series of steps in sequence:

- Sorption of a penetrant molecule on surface layer of stratum corneum.
- Diffusion through it and viable epidermis
- The molecule is taken up into the microcirculation for systemic distribution

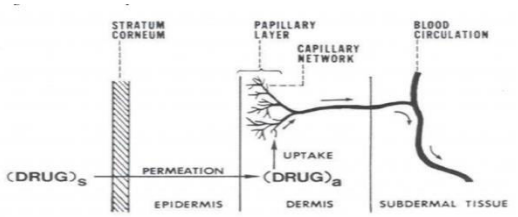

Fig. Multilayer skin model showing sequence of transdermal permeation of drug

Permeation Pathway :-Percutaneous absorption involves passive diffusion of the substances through the skin. A molecule may use two diffusional routes to penetrate normal intact skin, the appendageal route and the epidermal route.

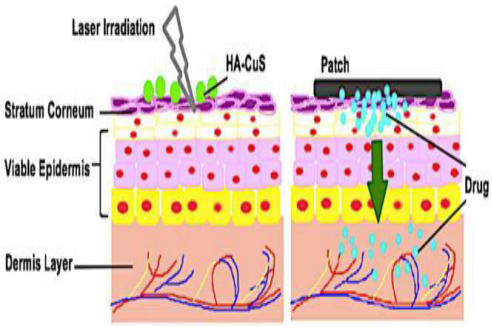

Fig. Permeation Pathway

For drugs, which mainly cross-intact horny layer, two potential micro routes exists, the trans cellular (intracellular) and intercellular pathways.

AIM AND OBJECTIVES

AIM: TO FORMULATE AND EVALUATE THE HERBAL ANTIDIBETIC PATCHES''

OBJECTIVES:

- To formulate herbal antidiabetic patch.
- To evaluate herbal antidiabetic patch

LIST OF CHEMICALS

Sr.no.	Name of Chemicals	Supplier
1	Neem, karela	Local market
2	HPMC	Ozone International Mumbai
3	Methyl cellulose	Ozone International
4	Polyethylene Glycol	Ozone International Mumbai
5	Ethanol	Ozone International Mumbai
6	Water	Ozone International Mumbai

EXPERIMENTAL SECTION

Phase - 2

Extraction :-

The dried leaves was collected and separated and then dried under shade drying for 4-5 days. Then the dried materials were grinded, sieved to get nearly fine or amorphous powder. Extraction is the process of obtaining the constituents by separating them from crude drug by the use of solvents. Powdered material of neem and karela was extracted with suitable solvent or mixture of solvent for extracting the various phytoconstituents present in the crude drug.

Preparation of neem extract :-

Dried leaves of neem were grinded and the powder obtained was weighed to get 100 gm powder. The 100 gm powder was imbibed with 350 ml of 90% ethanol for maceration for 7 days with occasional stirring. Ethanol extract collected and concentrated to get greenish residue. Extract stored in air tight container at cool and dark place.

Preparation of Karela extract :-

Karela powder was collected it is then weighed upto 100gm. Then weighed powder was followed for extraction same as that for karela fruit extract. The extract with brownish colour was obtained and stored at cool and dark place in air tight container.

Method:

The solvent casting method was used to prepare the transdermal patch.The drug matrix was prepared using the polymer HPMC.The polymer was weighed in the requisite ratio and a polymeric solution (5% w/v) was prepared by dissolving HPMC in ethanol:water (1:1) as a solvent system.When the polymer was mixed thoroughly, PEG as a plasticizer was added. After that, the drug solution was added in the polymeric solution and stirred for 45 min on magnetic stirrer to accomplish homogeneous mixture. After mixing, the drug and polymer solution was allowed to stand for 15 min to remove air bubbles and the resulting solution was poured in a glass ring placed on a petri dish containing mercury pool.The solvent was allowed to evaporate at 40°C for 24 h to achieve drug polymer matrix patch.After 24 h, the patch was collected and stored in desiccator until further use.

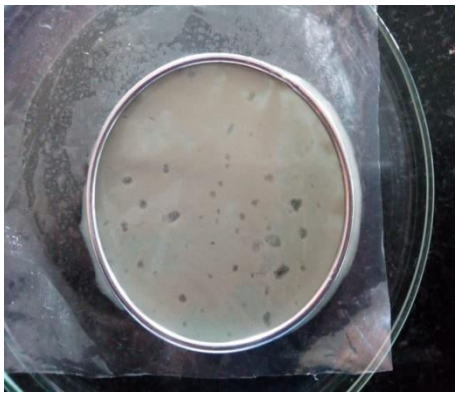

Fig.7.Casted patch

Fig.8.Prepared patches

FORMULATION OF PATCH

Sr.no	Ingredients	F1	F2	F3	F4	F5	F6
1	Drug(neem, karela ml)	0.013	0.013	0.013	0.013	0.013	0.013
2	HPMC(mg)	300	250	275	300	250	275
3	MC (mg)	300	150	75	300	150	75
4	PEG(%w/v)	30%	30%	30%	-	-	-
5	DBP (%w/v)	30%	30%	30%	30%	30%	30%
6	Ethanol:Water	1:1	1:1	1:1	1:1	1:1	1:1

EVALUATION OF PATCHES

PHASE -3

FOLDING ENDURANCE:

This was determined by repeatedly folding one film at the same place until it broke. The number of times the film could be folded at the same place without breaking/cracking gave the value of folding endurance.

MOISTURE CONTENT:

The prepared films were weighed individually and kept in a desiccator containing calcium carbonate at room temperature for 24 h.The films were weighed again and again individually after specified interval until it showed a constant weight.The moisture content was calculated as it was the difference between the constant weight taken and the initial weight and was reported in terms of percentage moisture content using formula:

Percentage moisture absorption =

Final weight – initial weight x100

Initial weight

DRUG CONTENT DETERMINATION:

Drug content was studied by an accurately weighing a portion of the film and was dissolved in 100 ml of phosphate buffer pH 7.4 and then the solution was stirred continuously for 24 hr. on magnetic stirrer.Then,the whole solution was sonicated.After bath sonication and subsequent filtration,the drug in solution was estimated spectrophotometrically by appropriate dilution.

MOISTURE UPTAKE:

The weighed film was kept in a vacuum desiccator at room temperature for 24 h, was taken out and then exposed to 84% relative humidity using a saturated solution of potassium chloride in a vacuum desiccator until a constant weight for the film was obtained. The moisture uptake was reported in terms of percentage moisture uptake and calculated using formula.

%Moisture uptake =

(Final weight – Initial weight) x 100

Initial weight

RESULT AND DISCUSSION

The formulated herbal anti-diabetic patches has better option for treatment on diabetes with minimum side effects and gives better result.The prepared patches were evaluated and result shown in tables.

Folding endurance:

The results of folding endurance studies for different formulations are shown in table below. The data show that the prepared formulations are found to be uniform with respect to folding endurance.

Moisture content

The moisture content was found to be increased with decreasing concentration of plasticizer PEG.

A little moisture content prevents the brittleness of patches and moisture content in the formulation was found to be low.

Moisture uptake

The % moisture uptake was found to be increased with decreasing concentration of plasticizer PEG.

Drug content

The karela, neem content in the methyl cellulose matrix patches in various formulations was found in between 89%

Physical characteristics of Herbal anti-diabetic patches

Formulations	Folding Endurance	%moisture content	%Moisture uptake	Drug Content
F1	11	2.35	4.91	89.16
F2	10	2.50	4.93	92.5
F3	10	3.10	5.48	90.4
F4	11	2.41	5.32	91.43
F5	12	2.60	5.96	94.56
F6	12	3.10	6.25	95.23

CONCULSION

It can be concluded that herbal drugs in the form of extracts can also be used in formulating transdermal patches due to the appropriate concentration of release of drug from the formulations by using this novel approach. It can be concluded that herbal drugs in the form of extracts can also be used in formulating transdermal patches due to the appropriate concentration of release of drug from the formulations using this novel approach

REFERENCES

1. Lalita Chauhan, SaloniVashisht,Formulation and evaluation of novel herbal antidiabetic transdermal patch,2018 Innovations in Pharmaceuticals and Pharmacotherpay, published by Innovational Publishers.
2. Tanner T, Marks R. Delivering drugs by the transdermal route: Review and comment. Skin Res Technol 2008;14:249-60.
3. Hupfeld S, GravemH.Transdermal therapeutic systems for drug

administration. Tidsskr Nor Laegeforen 2009;129:532-3.

4. Jain S, Joshi SC. Development of transdermal matrix system of captopril based on cellulose derivative. Pharmacolgyonline 2007;1:379-90.
5. Jona J, Audett J, Singh N. Recent Patents on Drug Delivery and Formulation. US Patent, US6071531A; 2000.
6. Verma PR, Iyer SS. Transdermal delivery of propranolol using mixed grades of eudragit: Design and in vitro and in vivo evaluation. Drug DevInd Pharm 2000;26:471-6.
7. Chein YW. In, Novel Drug Delivery Systems; 2nd Edn; Vol. 50, Marcel Dekker, New York, 1992, pp301-381.
8. Finnin BC, Morgan TM, Transdermal penetration, J. Pharm. Sci.1999, 88(10), 955- 958.