Formulation and Evalution of Transdermal Patches of Ethanolic Extract of Pongamia Pinnata Seed

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***Abstract*: The aim to study the formulation of transdermal patch by ethanolic extract of pongamia pinnata seed.The dried seed of pongamia pinnata is a popular growing tree in India,Africa,china. The plant are used as therapeutic agent such as anti-inflammatory, anti-cancer ,anti diarrial,anti arities etc The pongamia pinnata ethanolic extract was prepared maceration process. The seed extract with different ratio of dimethyl sulfoxide, pectin, hydroxyl propyl methyl cellulose, glycerin. Formulated transdermal patch were physically evaluated with regard to thickness,weight variation, drug content, flatness test, tensile strength, folding endurance, percentage of moisture content. All prepared formulations indicated good physical strength. Physiochemical characteristics and in-vitro permeation study of formulated transdermal patches were carried out.**

***Keywords:* Transdermal patch, Formulation, Pongamia pinnata seed, Evaluation.**

Introduction:

Pongamia pinnata is popularly known as karanja in Hindi, India Beech tree inb English and kanuga in telugu belongs to the family Fabaceae. Pongamia pinnata exhibits many pharmacological activity. The Indian system of traditional medicine Ayurveda and Siddha use pongamia pinnata to treat various kinds of diseases including diabetes mellitus. All parts of of the plant treatment of tumors,piles,skin diseases,itches,abscess, painful rheumaric joints,wounds,ulcers fodder green manure. The pongamia pinnata seed oil can be converted to biodiesel by trans-esterification method. The activities such as Anti inflammatory activity, Anti ulceric,wound healing propertywere reported. The literature survey on as ellite medicinal plant pongamia pinnata showed that it is a potential medicinal plant. Transdermal drug administration generally refers to topical 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. Transdermal drug delivery has many advantages over the oral route of administration such as improving patient compliance in long term therapy, bypassing first-pass metabolism, sustaining drug delivery, maintaining a constant and prolonged drug level in plasma, minimizing inter- and intra patient variability, and making it possible to interrupt or terminate treatment when necessary.

Materials and Methods:

Collection of pongamia pinnata seeds: The *pongamia pinnata* seeds were collected from in and around Perambalur.collected seed are authenticated by Botanist, Department of botany,national college, Trichy. Then the seeds are cleaned properly and shade dried at room temperature.

Cold maceration process seed of Pongamia pinnata: The collected, Cleaned and shade dried seed are subjected to the size reduction and Seived. Then the *pongamia pinnata* extract are prepared by cold maceration process. About 40 gm of dry powdered *pongamia pinnata* are taken with 250 ml of 70% (W/V) Ethanol are maceration for week in a round bottom flask with occasional shaking.

The flask was kept in the dark to avoid effect of the light on the active constituents of the pongamia pinnata. Then the extract are filtered through a muslin cloth after a week of maceration. The extract are concentrate till dryness. The use of water bath maintain the room temperature the extract are heated for evaporation till the gryness.

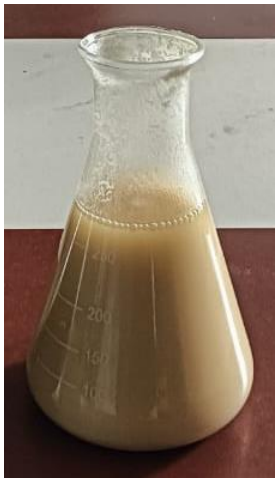

Figure no.1: cold maceration process

Figure no. 2:Crude Extract

List of Chemicals:

S.no	Chemical name	Company name
1.	Dimethylsulfoxide(DMSO)	Merck
2.	Gylcerine	Nice
3.	Pectin	Nice
4.	Hydroxylproplymethyl cellulose(HPMC)	Merck

Table no.1: list of chemicals

Formulation of Transdermal Patches: Four batches of drug loaded (seed extract of *pongmia pinnata)* transdermal patches were prepared using drug with two different polymer ratio(1:2 and 1:4). Weighed quantity of polymer was dissolved in calculated quantity of water and heated on a water bath. Calculated amount of extract was added to the above mixture and stirred well until a homogneous mixture was formed. Then calculated amount of permeation enhancer and glycerin were added. The resultant micture was poured into a petridish and air dried at room temperature for 24hrs, the patches are then peeled off from the petridish with the help of a knife and kept in desiccator.

S. no.	Ingredients	Formulation			
		F1	F2	F3	F4
1.	seed extract (mg)	10	10	10	10
2.	Pectin(mg)	20	40	-	-
3.	HPMC(mg)	-	-	20	40
4.	DMSO(ml)	0.3	0.3	0.3	0.3
5.	Glycerine(ml)	0.3	0.3	0.3	0.3
6.	Disilled water(ml)	q.s	q.s	q.s	q.s

Table no .2: Formulation for transdermal patches

Evaluation of Transdermal Patch:

Thickness: The thickness of patches was measured at three different places using a micrometer and mean values were calculated.

Weight Variation: The patches were subjected to mass variation by individually weighing randomly selected patches. Such determinations were carried out for each formulation.

Parameters	F1	F2	F3	F4
Thickness (µm)	120 ± 3.6	135 ± 4.05	142 ±4.26	186 ± 5.58
Weight variation (mg cm^{-2})	10.61 ±0.31	12.51±0.37	14.97 ±0.44	10.11 ±0.30

Drug content (%)	95.23 ±0.92	95.69 ±0.56	97.02 ±0.22	98.35 ±0.94
Folding endurance	209 ± 6.27	213 ± 6.39	210 ±6.3	234 ± 7.02
Tensile strength (kg cm^{-2})	3.15 ±0.094	3.51 ±0.105	3.83 ±0.114	2.12 ±0.063
Moisture content (%)	2.32 ±0.56	2.92 ±0.68	4.02 ±0.89	1.96 ±0.39

mean ± SD (n=3)

Table no.3: Evaluation of transdermal patches

Drug Content: Patches of specified area (1 cm^2) were dissolved in 5 mL of dichloromethane and the volume was made up to 10 mL with phosphate buffer pH 7.4; dichloromethane was evaporated using a rotary vacuum evaporator at 45 °C. A blank was prepared using a drug-free patch treated similarly. The solutions were filtered through a 0.45 µm membrane, diluted suitably and absorbance was read at 204 nm ina double beam UV-Vis spectrophotometer.

Flatness: Three longitudinal strips were cut out from each film: 1 from the center, 1 from the left side, and 1 from the right side. The length of each strip was measured and the variation in length because of non-uniformity in flatness was measured by determining percent constriction, with 0% constriction equivalent to 100%flatness.

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

Tensile strength: In order to determine the elongation as a tensile strength, the polymeric patch was pulled by means of a pulley system; weights were gradually added to the pan to increase the pulling force till the patch was broken. The elongation i.e. the distance traveled by the pointer before break of the patch was noted with the help of magnifying glass on the graph paper, the tensile strength was calculated as kg cm^{-2}.

Percentage of Moisture Content: The films were weighed individually and kept in a desiccators containing activated silica at room temperature for 24 hours. Individual films were weighed repeatedly until they showed a constant weight. The percentage of moisture content was calculated as the difference between initial and final weight with respect to final weight.

Preparation of Calibration curve of *pongamia pinnata* seed extract:

Accurately weighed quantity(100mg) of PE was transferred into a 100ml volumetric flask and dissolved in small amount of distilled water (D.w) and made up to the volume to make the standard stock solution of 1ml/mg.

From the stock, 1ml was taken in 10ml volumetric flask and made up the volume with the buffer, from this solution 0.5ml to 3ml solution was transferred to 10ml volumetric flask and made up to required volume with more D.W and the resulting concentration ranges from 5 to 50 ug/ml. The absorbance of these solutions was determined at 204nm using UV spectrophotometer. The calibration curve was constructed between the absorbance and concentration.

Results and Discussion:

A) Standard curve of Ethanolic extract of pongamia pinnata seed:

Concentration(ug/ml)	**Aborbance**
0	0.000±0.000
5	0.091±0.001
10	0.181±0.001
15	0.273± 0.001
20	0.363±0.001
25	0.459±0.008

Average±SD

Table no. :5 Standard curve of Ethanolic extract of pongamia pinnata seed

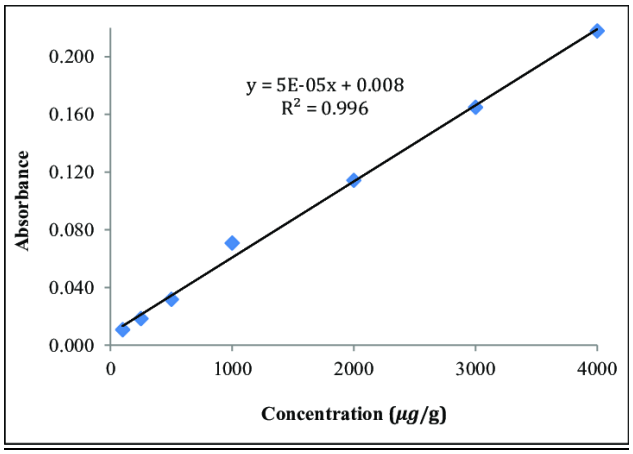

Figure no.4: Standard curve of Ethanolic extract of pongamia pinnata seed

B) Compatibility study:

FTIR Studies

Wavelength(cm^{-1})	Functional groups
3391.615	C=O stretching
2931.66	C-H stretching
1639.95	C-C stretching
1414.22	OH bending
921.39	C-O stretching
763.74,650.03	C-H Rocking

Table no.6: FTIR Interpretation of Ethanolic extract of pongamia pinnata seed

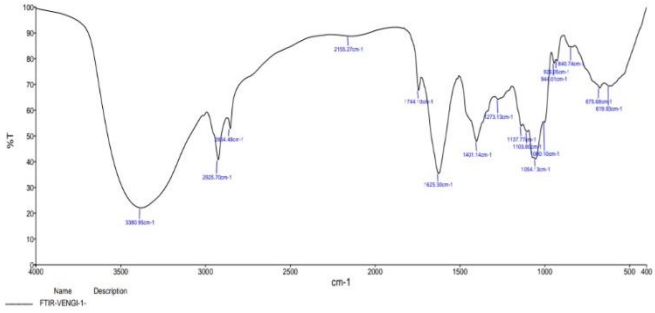

Figure no.5: FTIR Spectrum of Ethanolic extract of pongamia pinnata seed

C) FTIR Interpretation of Pectin

Wavelength(cm^{-1})	Functional groups
3442.09	C=O stretching
1931.41	C-C stretching
1742.41	C-C stretching
1232.88	OH bending
914.15	C-O stretching
769.94	C-H Rocking

Table no.6: FTIR Interpretation of Pectin

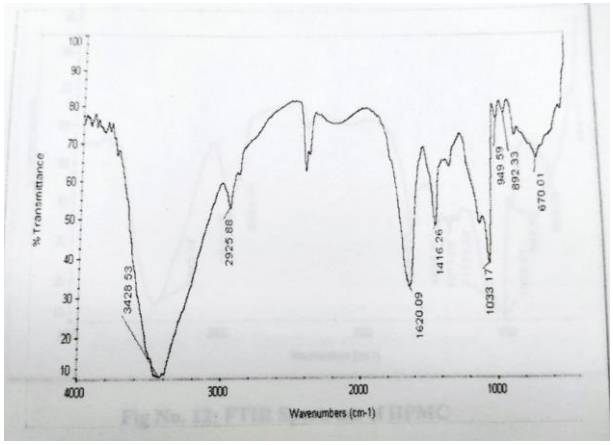

Figure no.6: FTIR Spectrum of Pectin

D) FTIR Interpretation of HPMC

Wavelength(cm^{-1})	Functional groups
3445.74	O-H stretching
2922.70	C-H stretching
1645.52,1459.59	C-C multiple bond stretching
1377.05	O-H stretching

Table no.7: FTIR Interpretation of HPMC

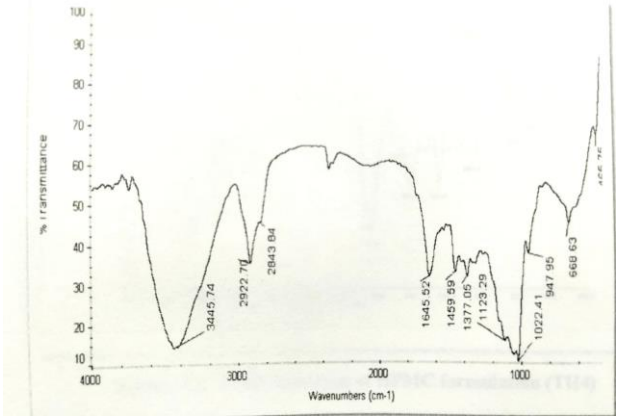

Figure no.7: FTIR Spectrum of HPMC

Conclusion:

The method of preparation of transdermal patches of seed extract of Pongamia pinnata presented in this research work issimple. All formulation also showed good physicochemical properties like thickness, weight variation, drug content, flatness, folding endurance, moisture content and moisture uptake. The *in-vitro* release data showed that drug release from the patch formulation have been affected by types of polymer and concentration of polymer. These studies indicated that as the concentration of penetration enhancer increased drug permeation was increased.

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