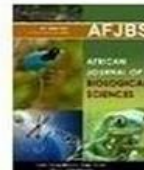




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Research Paper

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FORMULATION AND EVALVATION OF HERBAL COLOCASIA ESCULENTA PATCHES FOR THE TREATMENTS OF RHEUMATOID ARTHRITIS

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Abstract:

The dried version of Arbi leaves, often referred to as Taro, and has a reputation for being a good source of calcium. Arbi Scientifically named as *Colocasia esculenta*, it is a member of the Araceae family. It is a good calcium source. The goal of the current study was to formulate and assess herbal *Colocasia esculenta* patches for the treatment of arthritis. Patches of dried *Colocasia esculenta* leaves are used to treat arthritis. This project's goal is to reduce arthritic symptoms. *Colocasia esculenta* herbal patches can effectively treat arthritis without causing any adverse effects. *Colocasia esculenta* must first be dried before its herbal patches can be manufactured, which will aid in speed to arthritis. The allopathic healthcare system offers two conventional treatments for rheumatoid arthritis, both of which have disadvantages. It would be prudent to select Ayurvedic herbal medicine formulas that are dependable, safe, and efficacious. A chronic, progressive inflammatory illness that affects the peripheral joints and is typified by continuous inflammation is the characteristic of rheumatoid arthritis.

Key Words: *Colocasia esculenta*, patches, polymers

INTRODUCTION:

Arthritis is a severe disease. Arthritis is a chronic and inflammatory disease. It is a systemic auto immune disease and it's affected the joint of the persons [1]. Various factors include like: age, genetic, gender and environmentally (air pollution, smoking). Various complication can follow permanent joint damage needed arthroplasty, rheumatoid vasculitis. Arthritis is also Known as rheumatoid arthritis. This disease is not only affects the joint, but can affects the also internal organs like, kidney, intestine [2]. It commonly affects the women. It is including by multi -organ disorders, in connection to pain, swelling, and stiffness of multiple joints. Arthritis affects dysfunction and deformation of the affected joints. Thus, proper diagnosis and treatment are required in the early stages of the arthritis disease [3]. The term rheumatism comes from the 2500-year-old Greek word meaning "flowing current, flow affects the joints of body. In the twenty century, arthritis I an auto immune disease. This disease affects the humanity for long time. In 19th century introduced the salicin bark as a component. In 1853, Gerhardt first synthesized acetylsalicylic acid, which had superior in vivo stability to salicin, and 1897, acetylsalicylic acid was marketed as a tablet for arthralgia by Hoffmann in Bayer and is now widely used other conditions worldwide. In 1949 dr. Hench firstly administered cortisone in rheumatoid arthritis. He got Nobel prize medicine in 1950 [4]. Rheumatoid arthritis is annual spread about per 100,000 peoples and research says RA is more affects the woman compare to men, with a lifetime risk of RA 3.6% in women compared

to 1.7% in men and increase the rise age about 60 -85 [5,6]. Joint inflammation over time leads to the destruction of the joint with cartilage and bone erosion. RA with a symptom duration of fewer than six months is defined as early RA, and when the symptoms have been present for more than six months, it is defined as established RA. Arthritis is a critical disease that affects the musculoskeletal system, causing painful Inflammation and stiffness around joints. In Greek “arthro” means joint and “it is” means Inflammation and so arthritis is a joint disorder that involves swelling of joints [7]. In the laboratory we found the approximately 80% positive report for rheumatoid. even healthy peoples or patients with liver disease may be positive for these. Both the sensitivity and specificity of anti-CCP antibodies are 90% or higher, and patients with rheumatoid arthritis develop positivity prior to the onset of symptoms. In patients with high levels of anti-CCP antibodies for rheumatoid disease, the progress of joint failure is rapid. This disease primary affects the synovial fluid. We are discuss the etiology and pathology at specific stages: (i) triggering, (ii) maturation, (iii) targeting, and (iv) fulminant stage, concomitant with hyperplastic synovium, cartilage damage, and bone erosion. There has been significant progress toward achieving disease remission without joint deformity [8]. RA is affects the joints like hands, knee and wrist. In a joint with RA, the lining of the joint becomes inflamed, causing damage to joint tissue. RA or osteoarthritis affects the hip and knee joints. Before 35 years ago research create the artificial joints. More than 10 years ago, a mysterious new form of arthritis mysterious see in a began children and adults along the Connecticut shoreline. Researcher found the effective treatment by antibiotics [9].

SYMPTOMS:

- Pain or aching in more than one joint
- Stiffness in more than one joint
- Tenderness and swelling in more than one joint
- The same symptoms on both sides of the body (such as in both hands or both knees)
- Weight loss
- Fever
- Fatigue or tiredness
- Weakness

About 40% of people with rheumatoid arthritis have this type of rheumatoid arthritis. Symptoms occur that do not involve the joints. Affected areas include:

- ❖ skin
- ❖ eyes
- ❖ Lungs
- ❖ Heart
- ❖ Kidney
- ❖ salivary glands
- ❖ brain system
- ❖ bone marrow
- ❖ blood vessels

Sometimes period affect the disease activity, also known as flares [10].

Rheumatoid arthritis is an old chronic inflammatory disorder that can affect your joints. In some people, affects a wide variety of body systems, including the skin, eyes, lungs, heart and blood vessels.

INTRODUCTION OF COLOCASIA ESCULENTA (ARVI LEAF):

Colocasia esculenta is the botanical name of taro leaf. Colocasia esculenta leaves belong to the Araceae. Colocasia esculenta is contain major nutritional value of dried Colocasia esculenta leaves per 100gm 280kcl energy, 8gm fat, 45gm carbohydrate, 1500 mg calcium and 15gm protein. Rich source of iron, when the leaves boiled with coconut milk [11]. The Colocasia esculenta is used the various disorder like cardio vascular, liver disease, Central nervous system, metabolic disorder and digestive system. Colocasia esculenta leaves are more effective in the calcium deficiency [12]. Rich sources of protein, vitamin, energy and magnesium. Colocasia esculenta is the high rich sources of calcium, fibre and used as the energy sources. Present the rich sources of iron in the leaves, when the boiled with coconut milk make a soup [13-29]. Taro is most cultivated plant. It is the richer digestible carbohydrate. Colocasia esculenta is annual herbaceous plant. Colocasia esculenta is used as medicine because it's having the medicinal property. Juice if very effective for various disease like baldness and body headache.

MORPHOLOGY OF TARO LEAVE:

Scientific classification:

Kingdom	- Plantae
Sub kingdom-	Tracheobionta
Class	- Liliopsida
Sub class	- Arecide
Family	- Araceae
Species	- Colocasia esculenta
Synonyms	- Taro, Colocasia esculenta var.

Nutrition value of leaves:

Principle	Nutrient valve
Calories	42
Protein	5 g
Vitamin A	96%
Fats	0.07
Saturated fat	0.02
Vitamin C	87%
Sodium	3 mg
Calcium	11%

Carbohydrate 6.7g	6.7 g
Iron	12%
Dietary Fiber	3.7 g
Sugar	3 g

Taro is a rich source of digestible carbohydrates and micronutrients. Examples of anti-nutrients present in taro include tannin, phytate, and oxalate. Taro degrades quickly due to its high moisture content, but if it is stored undamaged and in a sheltered area, it can survive up to one month. New-borns kids with lactose intolerance, and people with cereal allergies can all consume foods made from taro [14].



Fig. no. 1: Taro tubers.



Fig. no.2: Taro leaves

MATERIALS AND METHODS:

PVP: used as polymer.

Ethyl Cellulose: used as stabilizers.

PEG 400: used as plasticizers.

DMSO: used as membrane penetration.

Ethanol: used in extraction process.

Extraction of plant material:

Plant leaves were cleaned with tap water three times and then with deionized water once to remove dirt. The cleaned leaves were left in the shade to air dry. Dried colocasia esculenta leaves powder, ethyl cellulose, polyvinyl pyrrolidone (PVP), and propylene glycol were purchased. To start the solvent extraction procedure, the dried leaves were ground into a coarse powder using a blending machine. Using the cold maceration extraction method, 50g of coarse leaf powder from Colocasia Esculenta was macerated in 500ml of ethanol for three days. The extracts were concentrated through evaporation and stored in an airtight container at a cool temperature for subsequent use.

Other than those already mentioned, analytical reagents grade laboratory chemicals were also used in the study. Various equipment types used in the formulation of herbal patches included a magnetic stirrer, Petri dish, ultrasonic

cleaner, Vernier calliper, electronic balance, pH metre, hot water bath, ultraviolet-visible spectrophotometer, tray dryer, hot air oven, and dissolution apparatus, among others [15, 16].



Fig No.3: Soxhlet assembly (extraction)

PREPARATION OF HERBAL COLOCASIA ESCULENTA PATCHES FOR ARTHRITIS

1. Phytochemical Screening[10-13]

Table: Phytochemical Screening of plant extracts

S.No.	Identification test	Observation	Inference
1.	<p>Alkaloids</p> <p>Mayer's Test Test extract + Mayer's reagent</p> <p>Tannic acid Test Test extract + Tannic acid solution</p>	<p>Cream coloured precipitate</p> <p>Buff coloured precipitate</p>	<p>Presence of alkaloids</p> <p>Presence of alkaloids</p>
2.	<p>Glycosides</p> <p>a. Extract +5ml dil.H₂SO₄, heat on water bath, neutralize with 5% NaOH solution, 0.1ml Fehling's A and B until it becomes alkaline, heat on water bath for 2 minutes.</p> <p>b. Extract +5ml water, heat on water bath, 5% NaOH solution, 0.1ml Fehling's A and B until it becomes alkaline, heat on water bath for 2 Minutes.</p>	<p>Red precipitate</p> <p>Red precipitate</p>	<p>Presence of Glycosides</p> <p>Presence of Glycosides</p>

3.	Tannins Gelatin Test Test solution + Gelatin solution containing 10%NaCl Lead acetate Test Alcoholic extract + Lead acetate solution	Precipitate is formed White precipitate	Presence of Tannins Presence of Tannins
4.	Carbohydraes: Extract + Molisch's reagent, shake and add Conc.H ₂ SO ₄ from sides of test tube. b. Fehling's Test Extract + Fehling's Solution A and B reagents	Formation of Violet colour ring at junction of 2 liquids. Brick red precipitate	Presence of Carbohydrates Presence of Carbohydrates
5	Flavonoids NaOH test Extract + NaOH Solution Lead acetate Test Extract + Lead acetate solution	Coloured precipitate Yellow coloured precipitate	Presence of Flavonoids Presence of Flavonoids
6	Amino acids Ninhydrin Test Extract + Ninhydrin Solution and boil. Millon's test Extract + Millon's reagent	Purple colour White precipitate	Presence of Amino acids Presence of Amino acids
7	Proteins Coagulation Test Heat the Test solution in a water bath Lead acetate Test Test solution + 40%NaOH + 10%lead acetate Solution.	Coagulation occurs Brown precipitate	Presence of Proteins Presence of Proteins

Evaluation of Herbal Transdermal Patches:

Physical appearance: The prepared patches are physically examined for color, clarity and surface texture.

Thickness: The patch's thickness will remain consistent throughout. The variance in thickness inside and between patches can be calculated.

Moisture content: Each patch is weighed separately and stored for a full day at room temperature in desiccators with fused calcium chloride. The patches should be weighed again after a day, and the formula should be used to determine the patches' percentage moisture content. Moisture content percentage is calculated as $(\text{original weight} - \text{final weight}) \times 100 / \text{initial weight}$.

Moisture uptake: $\% \text{Moisture uptake} = (\text{Final weight} - \text{Initial weight} \times 100) / \text{Initial weight}$

Weight uniformity: A predefined portion of the patches was carefully cut into segments, which were then measured with an electronic balance. The average weight and standard deviation were calculated from the individual weight.

Studies In-vitro permeation: To ascertain the drug's passage from the patch to the skin's microcirculation, permeability experiments are performed. Franz diffusion cell donor and receptor compartments were separated in this work by a synthetic membrane, such as cellulose nitrate. A 7.4 pH phosphate buffer was placed inside the receptor compartment. On the cellulose nitrate membrane facing the receptor compartment containing the phosphate buffer, a transdermal patch was applied. Utilizing a magnetic stirrer, the receiver chamber was continuously stirred while being kept at ambient temperature [22]. In order to keep the volume of the receptor compartment constant, samples were removed at certain intervals and replaced with an equal volume of phosphate buffer each. Following the withdrawal of samples, absorbance measurements were made, and concentrations were computed.

Skin irritation test: Extensive skin-to-skin contact can result in sensitization and irritation during times of high stress, as demonstrated by studies on skin irritation. The degree of skin irritation on the back of a volunteer is measured using a patch test. Using adhesive tape, a 2-by-2-cm² patch (F2) was attached to the volunteer's clean back. The participant was then observed for an additional four to six hours in case erythema, redness, sensitization, or any other allergic reaction showed any signs [19, 20, and 21]

RESULT AND DISCUSSION:

1. Characterization and identification of plant extract

Physical Properties:

Color	Light green
Odor	Characteristic odor
Taste	Slightly taste
Appearance	oily nature

Solubility Studies:

Water	Ether	Ethanol	5%NaOH	5%HCL	H ₂ SO ₄
Soluble	Insoluble	Soluble	Slowly Soluble	Slowly soluble	Insoluble

2. Plant extract preliminary phytochemical screening

Sr. No.	Plant constituents	Test / reagents	Colocasia esculenta extract
1	Sterols	Salkowaski test Liebermann-Burchard test	+
2	Alkaloids	Dragendorff's test Mayer's test Wagner's test	- - -
3	Saponins	Foam test Haemolysis test	- -
4	Glycoside	Borntrager's test	+
5	Tannins	Ferric chloride	+
6	Flavonoids	Shinoda test	+
7	Carbohydrates	Molisch test Barfoed's test Fehling's test	+
8	Protein	Biuret test Xanthoproteic test	+

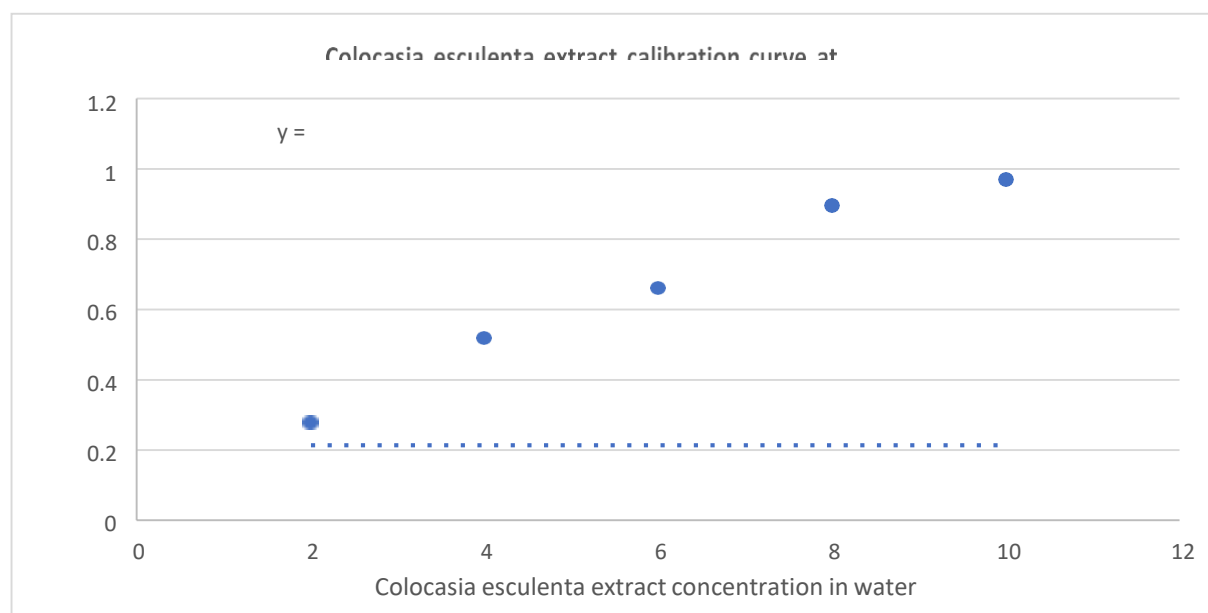
Calibration Curve

Determining the Colocasia esculenta extract's absorbance maximum

When Colocasia esculenta, family Araceae, extract was exposed to UV scanning, the maximum absorbance of 244.4 nm (λ_{max}) was found, which is consistent with the parameters documented in the literature. It was discovered that the absorbance maxima (λ_{max}) of the Colocasia esculenta extract concentration was 244.4 nm.

Colocasia esculenta (244.4nm)

Concentration ($\mu\text{g/ml}$)	2	4	6	8	10
Absorbance	0.267	0.418	0.552	0.876	0.871



EVALUATION AND CHARACTERIZATION OF HERBAL TRANSDERMAL PATCH

Physical Appearance

Formulation	B1
Colour	Light Yellow

Clarity	Translucent
Texture	Slightly Rough

Thickness of Patch

Formulation	Thickness(mm)	Average
F2	0.140 0.152 0.144	0.152 ± 0.007mm

Moisture Content

Formulation	Initial weight	Final weight	% moisture Content
F2	0.159gm	0.155gm	360%

Moisture Uptake

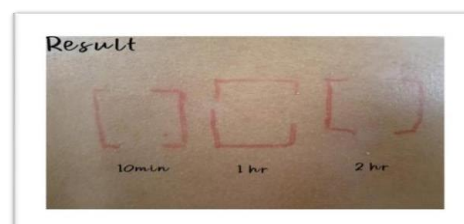
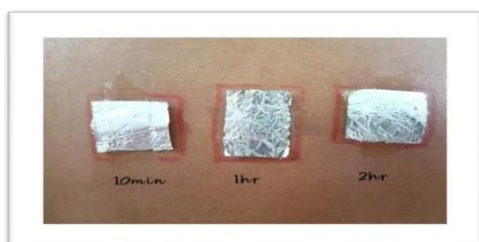
Formulation	Initial weight	Final weight	% moisture Uptake
F2	0.161gm	0.166gm	4.32%

Weight Uniformity

Formulation	Weight uniformity	Average
F2	0.155mg 0.160mg 0.164mg	0.161 ± 0.030gm

Drug Content Determination

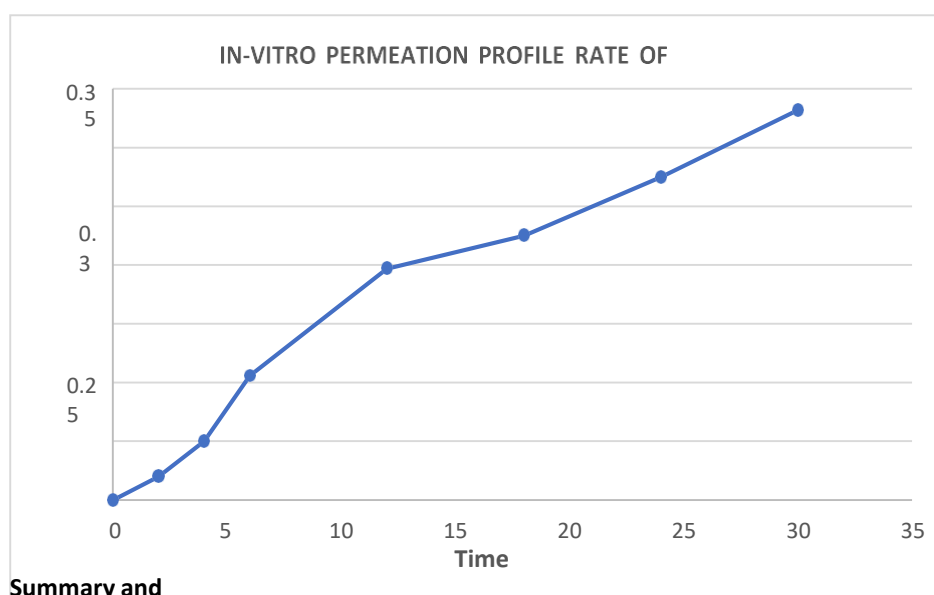
Formulation	Absorbance	% Drug content
F2	0.8234	84.79%

Skin Irritation Studies

TIME	INTERPRETATION
10 Min	No Reaction
1 Hour	No Reaction
2 Hour	No Reaction

In-Vitro Permeation Studies

TIME (In minutes)	ABSORBANCE (In nm)
0	0.0
20	0.02
40	0.05
60	0.107
120	0.196
180	0.224
240	0.270
300	0.335



Transdermal drug delivery system has been in existence for a long time. In the past, the most commonly applied systems were topically applied creams and ointments for dermatological disorders. Colocasia esculenta belonging to family araceae extract were used for its anti-inflammatory property. In the present investigation, herbal transdermal patches were formulated using HPMC and EC polymer by solvent evaporation technique. The physicochemical parameters like flexibility, thickness, smoothness, weight variation, moisture content and folding endurance were evaluated. The developed formulation showed good physicochemical properties like thickness, weight variation, drug content, folding endurance, moisture content.

Conclusion: This study aimed to produce transdermal patches for the treatment of rheumatoid arthritis utilizing aloe barbadensis and Cardiospermum helicacabum. Plants were found to include alkaloids, flavonoids, glycosides, saponins, and tannins according to phytochemical study. An ethanolic extract of this plant was chosen for the formulation development process, and it's in vitro anti-inflammatory properties resulted in the optimal formulation, F4, being chosen. The suggested formula tion demonstrated the maximum percent moisture uptake, moisture content, drug content thickness, folding durability, and percent elongation. The safety evaluation found that the developed formulation did not irritate human skin.

Transdermal herbal patches are believed to be a more effective treatment for rheumatoid arthritis than conventional dosage forms.

Conflicts of Interests: Nil

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