CRITERIA III

Key Indicator 3.3 - Research Publication and Awards

3.3.1 Number of research papers published per teacher in the Journals notified on UGC CARE list during 2023

Research Publication 2023

PES Modern college of Pharmacy (For Ladies), Moshi, Pune 412105.

RESEARCH PUBLICATION 2023

Year	Sr. No.	Name of Faculty	Title of the Paper	Name of Journal	Year, Vol, Page No, Issue	ISSN No.
2023	1	Shashikant Dhole, Nilesh Kulkarni	Development, Characterization and In Vitro - In Vivo Evaluation of Efinaconazole Loaded Niosomal Nail Lacquer for the Treatment of Onychomycosis	European Chemical Bulletin	2023, 12(04),	2063-5346
2023	2	Dr. Nilesh Kulkarni, Mr. Manojkumar Munde	A Concise Literature Review onNiosome Drug Delivery from Ancient to Recent	Asian Journal of Pharmaceutics	2023	0973-8398
2023	3	Dr. Nilesh Kulkarni, Dr. S N Dhole	Assessment and Outcome on Preparations, Characterization of Topical Targeted Nanosponge Based Drug Delivery: Critical Review	Asian Journal of Pharmaceutical and Clinical Research (AJPCR)	2023	2455-3891
2023	4	Dr. Ms. R. L. Mhetre	Nanonization-Based Solubility Enhancement By Loaded Porous Starch Foam: Nifedipine Tablet Formulation	Journal Of Pharmaceutical Innovation	2023, 18- 60-67.	1872-5120
2023	5	Dr. Mohini Upadhye	Impact of Hazardous Chemical compounds on Reproductive System Reported in Sanitary Products	Research Journal of Pharmacology and Pharmacodynamics	2023, 15 (03), 112-118.	0975-4407
2023	6	Ms. Rekha Bhalerao, Dr. Mohini Upadhye	A Review on Pharmacological Properties of Rubus fructicosus	International Journal of Ayurvedic Medicine	2023, 14 (11), 22-28	0976-5921
2023	7	Hemant Alhat, Manojkumar Munde, Nilesh Kulkarni, VrushaliTambe	Comprehensive review on nanocrystal technology in pharmaceutical formulations	International Journal of Pharmacy and Pharmaceutical Sciences	2023, 15 (4), 1-7	Online ISSN: 0975-1491 Print

						ISSN: 2656-0097
2023	8	Dr. Manojkumar Munde, Dr. Nilesh Kulkarni	A novel validated stability indicating method for quantification of Empagliflozin in bulk and marketed formulation by HPTLC applying experimental design approach	Indian Drugs	2023, 60 (6), 66-75.	0019462X
2023	9	Dr. Mohini Upadhye	Ayurvedic and Herbal Remedies for Neurological Disorders	International Journal of Creative Research Thoughts	2023, 11 (1), c513-c524	2320-2882
2023	10	Dr. Smita More	A Narrative Review on Drug Loaded Nanosponges as a Carrier for Drug Delivery	International Journal of Pharmaceutical Quality Assurance	2023, 14 (1), 244-249.	0975 9506
2023	11	Dr. Vijaya Vichare, Dr. V S Tambe, Dr. S N Dhole	Identification of Oxidative Degradation Products of Dapsone in Presence of Adapalene by RP-HPLC–MS	Chromatographia	2023, 223-235.	0009-5893
2023	12	Dr.Vijaya Vichare, Dr. S N Dhole	Molecular Docking Studies of Selected Phytoconstituents from Some Indigenous Medicinal Plants against Different Targets of Severe Acute Respiratory Syndrome Coronavirus 2	Journal of Preventive, Diagnostic and Treatment Strategies in Medicine (JPDTSM)	2023; 2(1):p 24-32.	2949-6594
2023	13	Shashikant Dhole,	Improved UV-Visible Spectrophotometric Analytical Method Development and Validation for Precise, Efficient and Selective Quantification of Atorvastatin Calcium in Bulk Form	International Journal of Pharmaceutical Sciences and Nanotechnology	2023; 16 (5) :6966-75.	0974-3278

2023	14	Smita D. More,	A Review on Solid Lipid Nanoparticles as Nano Drug Delivery Transporters	Current Nanoscience	20 (5); 2024: 644 - 670 Published on: 24 July, 2023	1875-6786
2023	15	Vijaya Vichare, Shashikant Dhole,	Simultaneous Estimation of Adapalene from Marketed Gel Formulation along with the Preservative Phenoxyethanol by UV-Visible Spectroscopy	Asian Journal of Pharmaceutical Research	2023; 13(3):206-9	2231-5691
2023	16	R. S. Shivarkar, N. S. Kulkarni, M. C. Upadhye	Formulation Development and Evaluation of a Polyherbal Suspension Containing Curcuma longa, Ocimumsantum and Azadirechta indica with Improved Antimicrobial Activity.	Journal of Natural remedies	*2023; 23*(3), 1025–1034.	2320-3358
2023	17	Chaitali Dongaonkar, Nilesh Kulkarni and Shashikant Dhole	Delivery System for Improvement in Solubility of Poorly Soluble Drugs	Indian Journal of Natural Sciences	2023; 14 (79): 60098-60104.	:0976 – 0997
2023	18	Swapnali Pharande	Design and Evaluation of Gastroretentive Mucoadhesive Tablet of Antihypertensive	European Chemical Bulletin	2023, 12(Special Issue 10), 4768 –4781	2063-5346
2023	19	R. S. Shivarkar	Formulation of Novel Silver Nanoparticles (Snps) Using Fungal Endophyte MacrosporiumFasciculatum and Evaluation of Their Antimicrobial Potential	Journal of Chemical Health Risks	2024; 14 (1): 2577-2581	ISSN:2251-6727
2023	20	Nilesh S. Kulkarni, Shashikant N. Dhole, Rahul S. Shivarkar	Development of Fast-dissolving Oral Dosage Form as Tablet using Binder as Vigna Mungo Mucilage and Oral Film using	Asian Journal of Pharmaceutics	Oct-Dec 20: 23 • 17 (4) | 754-762	1998-409X

			Solvent Casting Technique: Comparative Study			
2023	21	Nilesh S. Kulkarni, Shashikant N. Dhole,	A Comprehensive Review on Novel Lipid-Based Nano Drug Delivery	Advanced Pharmaceutical Bulletin	2024;14(1):34-47. Epub 2023 Oct 14.	2228-5881
2023	22	Nilesh S. Kulkarni	A Review on recent approaches for the use of different Analytical Techniques to Analyze some Calcium Channel Blockers and their Combinations with otherAntihypertensive Drugs	Current Indian Science	2023; 1(1): 1-28	2210-3007

DEVELOPMENT, CHARACTERIZATION AND IN VITRO - IN VIVO EVALUATION OF EFINACONAZOLE LOADED NIOSOMAL NAIL LACQUER FOR THE TREATMENT OF ONYCHOMYCOSIS

Vibhavari Chatur*[1], Shashikant Dhole[2], Nilesh Kulkarni[3]

[1*]PhD Scholar, PES Modern College of Pharmacy, Moshi, Pune 412105.

[2]Principal, PES Modern College of Pharmacy, Moshi, Pune 412105

[3]Associate Professor in Pharmaceutics, PES Modern College of Pharmacy, Moshi, Pune 412105

Running title: Efinaconazole Loaded Niosomal Nail Lacquer

Address for Correspondence:

Vibhavari M. Chatur

Rasiklal M. Dhariwal Institute of Pharmaceutical Education and Research, Pune-19.

Pune- 411 019, Maharashtra, India

Email ID- vibhavaric@gmail.com

Contact No: +91 9595478590

Abstract:

Objectives: The goals of the study were to develop, describe, and test the efinaconazole-loaded niosomes in Nail Lacquer so that they could be used to treat onychomycosis.

Methods: Using different ratios of non-ionic surfactants (Span 60 and Pluronic L121) and cholesterol, Efinaconazole niosomes were made using the probing sonication method. This was done to try to improve the poor penetration of topical medications into the skin and reduce the negative side effects that come with them. The niosomes that were made were tested for their size, how well they trapped drugs, and how well they released drugs in a test tube. The results showed that niosomes made with a ratio of 1:2 (Span 60: cholesterol) had smaller particle sizes and a high Entrapment Efficiency. Niosomal nail polish was made by using different polymers in a good way. The modified formulation was tested for stability, resistance to water, drug content, drug release in a test tube, antifungal effectiveness, and the ability to flow.

Results:Niosomes that had been loaded with efinaconazole were round and ranged in size from 95 to 135 nm. In vitro, the amount of drug that was released in 24 hours ranged from 25% to 86%, while the amount of drug that was trapped ranged from 40% to 90%. When efinaconazole niosomes were mixed with Span 60 and CHO in a ratio of 1:2, the results were promising and were used to make nail polish. Compared to the other formulations, the efinaconazole-loaded niosomal nail polish showed the best drug release (91.34 ±1.34), antifungal effectiveness, and smoothness. Most drugs that don't work well when taken by mouth can be put on the nails with nail polish. This method will make it easier for the medicine to get into the body through the nail. So, the created ENNL could be used as a system for putting drugs on the skin to treat onychomycosis.

Keywords: Efinaconazole, Niosomes, Nail Lacquer, Onychomycosis

REVIEW ARTICLE

A Concise Literature Review on Niosome Drug Delivery from Ancient to Recent

Karishma Markad[1], Shruti Burad[1], Nilesh S. Kulkarni[1], Manojkumar Munde[1], Rahul Khiste[2]

[1]Department of Pharmaceutics, PES Modern College of Pharmacy (For Ladies), Affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India, [2]Department of Pharmaceutical Chemistry, Marathwada Mitra Mandal's College of Pharmacy, Affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India

Abstract

About 50% of medications/drugs have obstacle of poor solubility, poor oral bioavailability, due to enzymatic/gastric degradation in the gastrointestinal tract pH, high pre-systemic intestinal and hepatic metabolism, permeability, small absorption window, and short residence duration at the absorption location. Niosomal drug deliveries have specific advantages over conventional dosage form with respect to improvement in bioavailability. Niosomes are colloidal particles created when non-ionic surfactants self-assemble in an aqueous solution to form closed bilayer structures. The various methods are reported until today for the preparation of niosomes; ether injection method, thin film hydration method, sonication method, microfluidization, multiple membrane extrusion method, reverse-phase evaporation technique, transmembrane Ph. Gradient drug uptake process (remote loading), the bubble method, freeze-thaw method, emulsion method, and formation of niosomes from proniosome. The current review article focused on the preparation and evaluation of niosome drug delivery and its advantages over conventional drug delivery. The niosomal drug delivery was found to be best for solubility and bioavailability enhancement of poorly water-soluble drugs.

Key words: Non-ionic surfactant, particle size, thin film hydration

INTRODUCTION

Oral route of administration is accepted to be the most convenient route for development of oral drug delivery system.[1] About 50% of medications/drugs have obstacle of poor solubility, poor oral bioavailability, due to enzymatic/gastric degradation in the gastrointestinal (GI) tract pH, high pre-systemic intestinal and hepatic metabolism, permeability, small absorption window, and short residence duration at the absorption location.[2] A variety of approaches can be used to modify the solubilization of drug and its bioavailability. Varied methods often used include micronation, chemical modification, pH adjustment, solid dispersion, complexation, cosolvency, micellar solubilization, and hydrotrophy.[3] The vesicles can operate as drug reservoirs and shield the drug from acidic and enzymatic degradation in the gastrointestinal tract. Niosomal drug deliveries have specific advantages over conventional dosage form with respect to improvement in bioavailability.[4] Niosomes are colloidal particles created when non-ionic surfactants self-assemble in an aqueous solution to form closed bilayer structures.[5]

FORMULATION COMPOSITION OF NIOSOMES[6,7]

Due to their lower irritant potential, non-ionic surfactants are preferred over cationic, anionic, and ampholytic.[6] Niosomes have a bilayer structure that is comparable to that of a liposome; however, they have more advantages over liposomes. Niosomes are tiny with size ranging from 10 nm to 100 nm. Niosomes contain both hydrophilic and lipophilic components, that is, amphiphilic nature. Niosomes have

Address for correspondence:
Dr. Nilesh S. Kulkarni,
Department of Pharmaceutics, PES Modern College of Pharmacy (For Ladies), Affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India.
E-mail: nileshpcist@gmail.com

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Review Article

ASSESSMENT AND OUTCOME ON PREPARATIONS, CHARACTERIZATION OF TOPICAL TARGETED NANOSPONGE BASED DRUG DELIVERY: CRITICAL REVIEW

SHRUTI BURAD*, KARISHMA MARKAD, NILESH KULKARNI, SHASHIKANT DHOLE

Department of Pharmaceutics, PES Modern College of Pharmacy (For Ladies), (Affiliated to Savitribai Phule Pune University), Pune, Maharashtra, India. Email: shrutiburad16@gmail.com, nileshpcist@gmail.com

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ABSTRACT

The pharmaceutical Industry, and most of the drugs which come from synthetic chemistry possess poor water solubility and approximately 70% of drugs fall under such category. To improve solubility, drug absorption and bioavailability are a critical lookout for the formulation scientist. The current research activity for the development of dosage forms is concentrated on the development of particulate carrier systems such as microspheres and liposomes. Nanosponge is being prioritized to control the delivery of drug/APIs/phytoconstituents to particular the skin targetting. The drug delivery to skin can be prevented through the development of nanosponge. Topical nanosponge preparation can be delivered in the form of local anesthetics, anti-fungal, anti-acne, anti-wrinkle, etc. drugs. The present study highlights the developmental stages for the topical targeted nanosponge drug delivery. The review covers a different method of preparation, and evaluation of topical nanosponge drug delivery systems.

Keywords: Topical targeted, Nanosponge, Particulate drug delivery.

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INTRODUCTION

The pharmaceutical industry, most of the drugs which come through synthetic chemistry possess poor water solubility, and approximately 70% of drugs fall under such category [1]. Improving solubility, drug absorption, and bioavailability is a task for the formulation scientist.

To overcome solubility, absorption and bioavailability issues topical route is preferred, and novel formulations such as nanosponge have been found beneficial. It is made up of microscopic particles having a few nanometers wide cavities in which drug substances can be encapsulated [2] and possess carrying capacity for hydrophilic and lipophilic drug molecules [3].

Conventional topical drug delivery systems such as gel, cream, and ointments are found to be less effective for permeation through the skin. Due to their low effectiveness and unpredictable drug release, traditional topical methods such as ointments and creams are associated with unpleasant side effects such as burning, contact dermatitis, and stinging sensations. The development of particulate carrier systems such as microspheres and liposomes is being prioritized to control the delivery of medications to particular skin regions. These systems are expected to regulate drug input rate, reduce drug absorption into the systemic circulation, and minimize undesirable effect. Several studies have demonstrated that nanoparticle carriers can replace liposomal carriers to provide better cutaneous distribution. Nanosponges an excellent choice for the producing of topical medicines because of their enhanced cosmetic qualities, improved safety, and product stability. Nanosponges can safely contain a variety of topical medications for controlled release [4]. The skin makes up 15% of the adult body weight, making the biggest organ in the body. Skin is composed of three layers, that is, The Epidermis, Dermis, and subcutaneous layers. The outermost layer the epidermis a stratified, squamous epithelium layer composed of keratinocytes and dendritic cells called keratinocytes. It showed the function to synthesizing keratin. Epidermis also contains other cell populations such as melanocytes, Langerhans cells, and Merkel cells.

Collagen, a fibrillar structural protein, makes the middle layer of the skin that is Dermis. The Dermis is fibrous, filamentous, and amorphous connective tissue. The panniculus is a subcutaneous tissue that include tiny lobes of fat cells known as lipocytes, are placed on top of the dermis. Subcutaneous tissue is the innermost layer of the skin. The fat cells begin to develop in the subcutaneous tissue. These fat cell lobules, also known as lipocytes, are divided by fibrous septa comprised of collagen and large blood arteries. The hormones leptin is produced by lipocytes that, regulates body weight by way of the hypothalamus. From that skin structure, the nanosponge can pass into body [5].

Nanosponges can hold drug molecules and deliver them to specific sites or organs in a controlled release manner. Topical nanosponge preparation can be provided in the form of local anesthetics, anti-fungal, anti-acne, and anti-wrinkle types for dosage form [6]. The methods for preparing the Melt method, ultra sound assisted method, and cross-linking method [7]. Topical nanosponge formulation can be formulated for drugs/APIs such as cyclosporin B, Indomethacin, and fenofibrate. Most drugs for the formulation of nanosponge belong to the biopharmac classification system (BCS) Class II drugs and the drugs which possess extensive first-pass metabolism [8]. The nanosponge has the advantage of improved skin penetration of drugs. Nanosponges forming 3-dimensional networks or scaffolds developed using a suitable polymer [9]. These polymers can degrade naturally and are mixed with a cross-linker in a solution to form nanosponge [10].

Objectives of Nanosponge dosage form development include:

1. To enhance the solubility of poorly soluble drugs.
2. To increase the bioavailability of the drugs.
3. To increase, prolong, and control release of a drug.

Advantages

1. Nanosponge acts like a self-sterilizer.
2. Nanosponges increase solubility of lipophilic drugs. e.g., Celecoxib [1]
3. They help to reduce side effects.
4. Nanosponges help to remove toxic substances from the body.
5. Nanosponges increase the bioavailability of the drug. e.g., Erlotinib hydrochloride [11].
6. It reduces dosing frequency.
7. Nanosponges protects the molecule from degrading. e.g., Doxorubicin [12].
8. Nanosponges release drugs in a controlled manner.
9. These are free-flowing substances.

- Original Article
- Published: 17 February 2022

Nanonization-Based Solubility Enhancement by Loaded Porous Starch Foam: Nifedipine Tablet Formulation

- Pratibha Milind Chaudhari,
- Paul Johnson,
- Raksha Laxman Mhetre &
- Antoine Al-Achi

Journal of Pharmaceutical Innovation (2022)Cite this article

Abstract

Background

Nifedipine (NIF) is a 1,4-dihydropyridine, calcium channel blocker, widely used in the treatment of cardiovascular diseases. NIF is poorly soluble in water at room temperature. Biodegradable porous starch foam (BPSF) has great potential as a solid dispersion carrier and can improve the solubility of poorly water-soluble drugs like NIF.

Objective

To formulate and evaluate tablet formulation of nifedipine-loaded biodegradable porous starch foam to improve the solubility of the drug.

Methods

The physical properties and the dissolution profile of NIF/BPSF mixtures and tablets were investigated. The BPSF was prepared by using a solvent exchange method, and NIF was loaded using an immersion/solvent evaporation method. The samples were characterized using differential scanning calorimetry (DSC), Fourier transform infrared spectroscopy (FTIR), powder X-ray diffraction (PXRD), and optical microscopy.

Results

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A Review on pharmacological properties of *Rubus fructicosus*

Review Article

Gaikwad Mayuri[1*], Bhalerao Rekha[2], Thorat Priyanka[1], Upadhye Mohini[2]

1.Research Scholar, 2.Assistant Professor,
Progressive Education Society's Modern College of Pharmacy (Ladies), Moshi, Pune, India.

Abstract

Medicinal plants are an excellent source of physiologically active phytochemicals with long-recognized medicinal properties. *Rubus fruticosus* also known as blackberry plant. The parts are employed for their therapeutic benefits. The purpose of this study was to review the pharmacological characteristics of *R.fruticosus* and its associated phytochemicals. Its extractions have a significant impact on the phytochemical and pharmacological activities. In this review, the most useful phytochemicals include flavonoids, anthocyanins, tannins and phenolic compounds, which are acquired from the plant's components. The various pharmacological actions of plants are mostly caused by phytoconstituents produced in plant tissues. It has demonstrated antibacterial, antioxidant, anti-inflammatory, antiwrinkle, anxiolytic, SPF and other actions that may be helpful in the creation of future pharmaceutical products.

Key Words: *R.fructicosus,* Blackberry, Anti-inflammatory, Anticancer, Antioxidant, Antimicrobial.

Introduction

Rubus fructicosus commonly known as blackberry belonging to family *Rosaceae.* It contains roughly 700 species. It's widely known for its fruit which has medicinal, nutritional and beauty purpose. In English is generally called, covert or European blackberry or scald head or shrubby blackberry or Wild blackberry. In India, particularly in Hindi, it's known as Vilaayati Anchhu or kaalaa jaamun. It's known as Tût shawkî or' Ullayq in Arabic(1). Blackberry leaves have been traditionally used as an antimicrobial agent and for their healthy antioxidant effect. In Europe it used for treating diabetes. An extract of the leaves showed a hypoglycemic effect on diabetic rats, Juice, fruits is effective in condition of anemia. Leaves and roots of the plant are long- standing home remedy for anaemia, regulates menstruation, diarrhoea, and dysentery(5).The blackberry gave triterpene erosive and rubitic erosive described as 7 alpha - hydroxyursolic erosive. Blackberries are outstanding for their high nutritional substance of salutary fibre, nutrient C, nutrient K, and mineral manganese. The root contains saponins and tannins. Fruits are assembled for jam, bathos, wine, and alcohol (7). *Rubus fruticosus*; fruits, leaves, stems, and roots shows essential medical applications. *Rubus fruticosus* are well known for its antidiarrheal, antioxidant, anti-inflammatory, anticancer and other properties. Phenolic compounds are the major active component present in large number. The aroma compounds were identified as 2-heptanol, p-cymen-8-ol, 2-heptanone, 1-hexanol, α-terpineol, pulegone,1-octanol, isoborneol, myrtenol, 4-terpineol, carvone, elemicine, and nonanal in thornless evergreen blackberry(6). Cyanidin-3-glucoside, a natural product present in blackberries, possesses chemo-preventative and chemotherapeutic conditioning in experimental models(8). Ripened fruit when taken in combination with leaves of Achyranthes aspera is used in treating eye diseases(9). The ideal of this review is to explore the recent activities on anticancer, antidiarrheal, antioxidant, anti-inflammatory eventuality of *R.fruticosus* and identify its active fragments from which implicit the activity.

*** Corresponding Author:**
Gaikwad Mayuri
Research Student, Department of Pharmaceutical Quality Assurance. Progressive Education Society's Modern College of Pharmacy For Ladies, Moshi, Pune-412105. Maharashtra. India.
Email Id: mayurigaik28@gmail.com

Aim

Encourage research on *Rubus fructicosus* for its potential to treat a range of illnesses.

Objective

To enable research on *Rubus fructicosus* for its potential medical benefits.

Table no.1 Classification for Kingdom *Plantae* Down to Species *Rubus fruticosus* L. (10)

Rank	Scientific name and common
Kingdom	Plantae – Plants
Sub-kingdom	Tracheobionta – Vascular plants
Super division	Spermatophyta - Seed plants
Division	Magnoliophyta - Flowering plants
Class	Magnoliopsida - Dicotyledons
Subclass	Rosidae
Order	Rosales

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Review Article

COMPREHENSIVE REVIEW ON NANOCRYSTAL TECHNOLOGY IN PHARMACEUTICAL FORMULATIONS

MANOJKUMAR K. MUNDE*, ANKITA M. SHINDE, NILESH S. KULKARNI, VRUSHALI S. TAMBE, HEMANT P. ALHAT

*PES Modern College of Pharmacy (for Ladies), Affiliated to Savitribai Phule Pune University, Moshi, Pune 412105, Maharashtra, India
Email: manojpcist@gmail.com

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ABSTRACT

Many techniques have been developed to overcome the bioavailability problem of poorly soluble drugs. The nanonization is one of the techniques in that micronized particle is converted in nanoparticle. Several processes are applied for nanocrystal production, including precipitation, milling, high pressure homogenization and combination method. The nanocrystal formulation is administered via various routes like oral, intravenous, intramuscular, pulmonary, ocular and dermal but due to safety, patient compliance and ease of administration, oral drug delivery is preferred. There are two basic ways to prepare drug nanocrystals like "bottom-up" and "top-down" technologies. The present literature provides an overview of the achievement in improving the bioavailability of the poorly soluble drug by using different methods.

Keywords: Nanocrystal, Bottom-up, Top-down, Poor solubility, Bioavailability

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INTRODUCTION

About 60 % of new drugs are poorly water-soluble and it is believed that approximately 40% of drugs under development currently have solubility issues. The drug's low solubility is a major hurdle that must be overcome in order to create extremely potent pharmaceutical formulations. Low solubility medications have poor oral bioavailability and variable absorption, which is especially important for pharmaceuticals of biopharmaceutical class 2 (BCS) [1].

In oral administration, the drug must be present at the site of absorption in the dissolved state to achieve its pharmacological activity. The poor oral bioavailability of drugs caused by their poor aqueous solubility has always been a difficult issue in pharmaceutical research. To increase a drug's solubility in water, a variety of strategies have been explored including salt formation, co-solvents, complexes with cyclodextrins and solid-state changes. A promising method to increase the apparent saturation solubility, dissolving rate and oral bioavailability of hydrophobic medicines like BCS Class II sometimes also with BCS Class IV pharmaceuticals. Drug nanocrystals are carrier-free submicron colloidal drug delivery systems with a mean particle size in the nanometre range, typically between 10 and 1000 nm, made up of pure medicines and the bare minimum of surface-active agents needed for stability [2].

A logical progression is "nanonization," or the reduction of micronized particles to nanoparticles. Many different nanonization techniques have been developed to improve the bioavailability and solubility rates of numerous drugs that are poorly soluble in water. These techniques include boosting surface area, altering crystalline morphologies and creating brand-new nanomaterials that can serve as controlled release carriers.

Surface stabilised crystalline nanoparticles with sizes ranging from 200 to 500 nm are known as drug nanocrystals. They improve the oral bioavailability of drugs with dissolution rate-dependent bioavailability by increasing the saturation solubility, dissolution rate and possibly mucoadhesion [3].

Drug nanocrystals are a versatile formulation approach that can be used to improve the pharmacokinetic and pharmacodynamic properties of poorly soluble drugs. NCs (nanocrystals) stand out not only among pharmaceuticals but also among other nanoparticles due to their ease of formulation and production scaling flexibility, as well as their inherent small particle size and large surface area [4, 5].

The production of nanocrystals is just one method of modifying the intrinsic properties of the raw material: when particle size is reduced to nanosized area, intrinsic properties such as solubility are altered in comparison to bulk-sized drug powders. The overall advantages of small particle size can be divided into three categories: (I) fast dissolution (ii) increased solubility and (iii) improved membrane adhesion. The most important effect achieved with drug nanocrystals is a faster dissolution rate due to the large surface area per mass solid. However, the role of stabilisers and their careful selection should not be ignored. The primary function of stabiliser is to protect inherently unstable drug nanoparticles from aggregation and/or Ostwald ripening following the production and storage of nanocrystalline formulations. However, many of the stabilisers used can help to maintain the supersaturated state *in vivo* reached after fast dissolution of nanocrystals or they can act as permeation enhancers [6].

Fig. 1: Nanocrystal with surface modification

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A NOVEL VALIDATED STABILITY INDICATING METHOD FOR QUANTIFICATION OF EMPAGLIFLOZIN IN BULK AND MARKETED FORMULATION BY HPTLC APPLYING EXPERIMENTAL DESIGN APPROACH

Manojkumar K. Munde[a,b]*, Nilesh S. Kulkarni[b], Ashim K. Sen[a] and Dhanya B. Sen[a]

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ABSTRACT

For the purpose of analyzing empagliflozin, a stability indicating high performance thin layer chromatographic method was developed. This method was optimized using design of experiment. In order to optimize the process, independent variables such as the proportion of isopropyl alcohol in the mobile phase, the duration of time that the chamber was saturated and the distance of mobile phase travelled were considered. On an aluminum plate that had previously been coated with silica gel, development was carried out with the assistance of twin trough glass chambers in ascending lines. The findings from these studies led to the selection of a mobile phase that had a composition of ammonium acetate (2 %), triethylamine and isopropyl alcohol in the ratio of 4:1:5 (V/V/V), and this mobile phase was utilized in the process of method development using central composite design approach. The saturation time was established at 10 minutes, and the ultraviolet detection was performed at a wavelength of 237 nm. The value 0.82 was discovered to be the retention factor (R_f) for empagliflozin. The method was linear, precise and accurate over the entire concentration range examined (100-600 ng band^{-1}), along with correlation coefficient value of 0.992. The proposed method is quick and selective, and a straightforward method of sample preparation and analysis for empagliflozin in its bulk and commercially available dosage forms. The stability of the drug was tested under a variety of different stress conditions in accordance with ICH guidelines, and the results obtained from the force degradations indicate that the developed method is appropriate for stability studies.

Keywords: Empagliflozin, method development, validation, DoE, HPTLC, Forced degradation study

INTRODUCTION

Empagliflozin (EN) is a drug that is used to treat type 2 diabetes and is an inhibitor of the sodium glucose cotransporter-2 (SGLT-2). SGLT-2 inhibitors, also known as gliflozins, are recently developed anti-hyperglycemic medications. EN reduces blood sugar levels by preventing the kidneys from reabsorbing glucose. EN (Fig. 1) is 1-chloro-4-(glucopyranos-1-yl)-2-(4-(tetrahydrofuran-3-yloxy) benzyl) benzene, according to its chemical structure[1,2]. The review of literature for EN with its analytical method should include the following procedures for pharmaceutical dosage form, either alone or in combination with metformin hydrochloride/linagliptin. Thorough review of the literature revealed numerous high performance liquid chromatography (HPLC)[3–17], high performance thin layer chromatography (HPTLC)[18–19] and spectrophotometry[20–23] methods for the analysis of EN. A high performance thin layer chromatography (HPTLC) method has been developed for estimating EN in formulations using the central composite design (CCD) approach. The method that has been suggested will prove useful for the quantification of EN in bulk as well as for marketed dosage form. Using a CCD strategy, the proposed work aimed to develop a high performance thin layer chromatography (HPTLC) analytical method that could indicate stability.

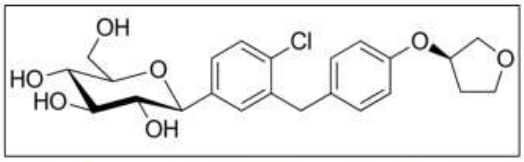

Fig. 1: Chemical structure of empagliflozin (EN)

[a] Department of Pharmacy, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara-391 760, Gujarat, India
[b] PES Modern College of Pharmacy (for Ladies), Affiliated to Savitribai Phule Pune University, Moshi, Pune-412 105, Maharashtra, India
*For Correspondence: E-mail: manojpcist@gmail.com

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Ayurvedic and Herbal Remedies for Neurological Disorders

1Priyanka Ramesh Thorat, 2Mayuri Kumar Gaikwad, 3Mohini Upadhye

1M.Pharm (PQA), 2M.Pharm (PQA), 3HOD of Pharmacognosy

1Savitribai Phule Pune University/PES Modern College of Pharmacy For Ladies, Moshi-Pune ,

2Savitribai Phule Pune University/PES Modern College of Pharmacy For Ladies Moshi-Pune ,

3PES Modern College of Pharmacy For Ladies, Moshi-Pune

Abstract: Synthetic remedies for human brain disorders are premium characteristic long treatments, sometimes showing serious and necessary side effects with poor patient compliance. Therefore, the herbal and Ayurvedic treatments are preferred over synthetic remedies for a range of human brain disorders including, Alzheimer's disease, depression, anxiety, etc.

Ayurvedic system of medicine has traditionally been used in several neurological conditions. The accessibility, negligible prevalence of side effects and cost effectiveness of plant products offer considerable advantages. These days major attention is drawn towards the established traditional systems of herbal remedies for multiple brain disorders, generating positive hopes for the patients.

Ayurveda the ancient holistic knowledge of India is treating neurological conditions since its inception. Neurological problem in Ayurveda described substantially in the context of Vatavyadhi.

Ayurvedic treatments for neurological disorders will aim to rectify this Vata imbalance and bring the Vata dosha in balance with Pitta and Kapha dosha so as to exclude the complaint.

Recent advancement of Ayurvedic Clinical Research shows that so numerous incurable neurological problems can be successfully treated by Ayurvedic drugs and Panchakarma therapies.

Keywords: Alzheimer's, Depression, Anxiety, Insomnia, Migraine.

Objective: This review will indicate the quality of the documentation advocating the clinical effects of a number of generally used types of herbal medicines for neurological disorders.

Method: We conducted a review of literature to understand the biochemical and evidential bases for the usage of herbs in neurological disorders as follows: 1) Alzheimer's

2) Depression 3) Anxiety 4) Insomnia 5) Migraine.

Introduction:

Herbal drugs include a range of pharmacologically active components: in some cases, it is not well understood which ingredients are important for a remedial effect. The supporters of herbal drugs believe that isolated ingredients in the majority of cases have delicate clinical effects than whole plant extract, a claim that would obviously bear evidence in each case.

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REVIEW ARTICLE

A Narrative Review on Drug Loaded Nanosponges as a Carrier for Drug Delivery

Anuradha Salunkhe*, Smita More, Shashikant Dhole

Department of Pharmaceutics, Progressive Education Society's, Modern College of Pharmacy (For Ladies), Moshi, Affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India

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ABSTRACT

Long-term attempts to create efficient, targeted medication delivery systems have been delayed by the complexity of the chemical interactions required to build drug delivery systems. Colloidal nanosponges may be adapted to operate with hydrophilic or hydrophobic medicines. This implies that issues with medicine toxicity, reduced bioavailability, and widespread drug release might all be addressed. A nanosponge is a microscopic sponge that can navigate its way to the required location within a living organism. The drug is gently released as the patch clings to the skin of the afflicted region. The nanosponge's porous construction allows it to trap drug molecules and release them gradually. Perhaps the most exciting development in the pharmaceutical industry is the nanosponge drug delivery device (NSDDS). This review aims to give readers an in-depth look at how nanosponges are made, evaluated, and put to use in the medical field.

Keywords: Controlled release, Crosslinking, Nanosponges, Cyclodextrins.

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Conflict of interest: None

INTRODUCTION

Some have even said that nanotechnology is more revolutionary than the Industrial Revolution itself. In addition to nanoparticles, nanocapsules, nanospheres, nanosuspensions, nanocrystal, and nano-erythosomes have all been created thanks to nanotechnology. Nanoscale fabrication and modification techniques enable nanotechnology to produce unique materials and devices. At this time, nanomaterials are the subject of intensive study. In 1959, Caltech physicist Richard P. Feynman provided an informed opinion on the topic of nanomaterials. He argued that the key to the future of nanotechnology was to start small and work up from the nanoscale. Any substance with at least one dimension between 1 and 100 nm is considered a nanomaterial. Biocompatible materials, functionalized textiles, UV-protective coatings, and agents that speed up the killing of germs, carry medicines, transfer DNA, and immobilize enzymes are just some of the many products that make use of nanoparticles.[1]

For quite some time, the administration method of desired medications has been the focus of such efforts. Like other modern medicines, nanosponges may be injected or taken orally in the 21st century. Nanosponges were originally developed for topical (skin) medication administration (IV). A nanosponge, a contemporary material, consists of very small particles that are closely packed together. Many items can be stuffed into these little spaces. The microscopic particles may carry both hydrophilic and lipophilic drugs. Drugs and other chemicals that don't dissolve easily in water are stabilized in this manner. The nanosponges are likely to decompose in live organisms since they are constructed from a polyester network or a three-dimensional scaffold. These polyesters and a cross-linker are combined in a liquid form to create Nanosponges. Polyester is biodegradable. Therefore, it disintegrates when ingested. Toxic drug molecules are released when the framework of the nanosponges breaks down.[2]

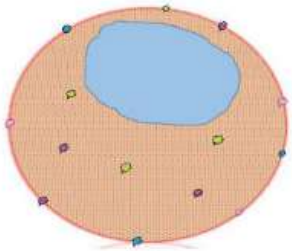

Figure 1: Nanosponges with a cavity for drug loading, structurally.

*Author for Correspondence: anuarjunsalunkhe@gmail.com

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ORIGINAL

Identification of Oxidative Degradation Products of Dapsone in Presence of Adapalene by RP-HPLC–MS

Vijaya Vichare[1] · Priyanka Handargule[1] · Vrushali Tambe[1] · Shashikant Dhole[1] · Vishnu Choudhari[2]

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Abstract

A simple stability indicating RP-HPLC method for the analysis of Adapalene and Dapsone in pharmaceutical gel formulation was developed and validated. A gradient elution was performed on an analytical column Phenomenex Kinetex C8 (150 × 4.6 mm, 5 micron) kept at 30 °C. Chosen mobile phase for the analysis was acetonitrile: water at the pH (2.5) adjusted by orthophosphoric acid. The detection wavelength was selected as 237 nm. The linear relation for Dapsone and Adapalene was found in the range of 50–150 µg/mL and 1–3 µg/mL, respectively. The detection limit values for Dapsone and Adapalene were found to be 2.19 µg/mL and 0.10 µg/mL, respectively. While, the quantitation limit values were 6.64 µg/mL and 0.30 µg/mL, respectively, for Dapsone and Adapalene. For the precision studies % RSD values were found to be less than 2. The specificity of the method was verified by subjecting both the drugs to acid, alkali, oxidative, thermal degradation and photo stability studies. The developed method was validated by reaching satisfactory results for linearity, specificity, precision, accuracy, robustness and system suitability. The forced degradation studies concluded that, Dapsone was liable to degradation under all tested conditions except dry heat, whereas Adapalene was liable to degradation under all tested conditions except oxidation. Two well-resolved degradation products were generated by the oxidative degradation of Dapsone. Both the degradation products were isolated by preparative TLC and characterized by LC–MS. From the MS data probable structures of degradation products were proposed. From the above study it was suggested that Dapsone should be protected from oxidation during storage.

Keywords Dapsone · Adapalene · Method development · Degradation product · Stability studies

Introduction

Dapsone (Di-4,4′-aminophenylsulfone) (Fig. 1) exhibits antibacterial activity against a variety of microorganisms, including *Mycobacterium leprae*, *Mycobacterium tuberculosis*, streptococci, pneumococci and has been widely used to treat leprosy and dermatitis herpetiformis. Dapsone has been recommended in the treatment of acne vulgaris [1]. Topical and oral formulations of Dapsone are commercially available. Topical formulation of Dapsone is available in the form of a 5% gel with brand name Aczone. Oral formulation of Dapsone is used less frequently than other sulfa medication antibiotics, many of which have side effects [2]. Dapsone shows adverse effects, such as mild haematolytic anaemia, gastric intolerance, nausea, vomiting, headache, paresthesia, mental symptoms and fever [3, 4]. Dapsone inhibits dihydrofollic acid synthesis by competing for the active site of dihydropteroate synthetase with para-aminobenzoate. Although the exact mechanism through which dapsone exerts its anti-inflammatory activity has yet to be fully elucidated, this agent interferes with the activation and oxidative damage of myeloperoxidase in neutrophils and inhibits the integrin-mediated adherence and chemotaxis of neutrophils [1]. Dapsone in combination with clofazimine is used in the treatment of leprosy [2, 5]. Dapsone by mouth was one of the first medications used to treat moderate to severe acne vulgaris. Dapsone is used in combination with pyrimethamine in the treatment of malaria. It is an official drug in IP [6], BP [7] and USP [8].

Adapalene is a topical third generation retinoid that is used to treat mild to moderate acne [9]. It helps so well in

✉ Vijaya Vichare
vicharevijaya11@gmail.com

[1] PES Modern College of Pharmacy (for Ladies), Moshi, Pune, Maharashtra, India

[2] School of Pharmacy, MIT World Peace University, MIT Campus, Kothrud, Pune, Maharashtra, India

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Molecular Docking Studies of Selected Phytoconstituents from Some Indigenous Medicinal Plants against Different Targets of Severe Acute Respiratory Syndrome Coronavirus 2

Vijaya Sachin Vichare, Snehal H. Sutar, Manasi Pratap Rokade, Shashikant N. Dhole, Vishnu P. Choudhari[1]

Abstract

BACKGROUND: COVID-19 is a transmissible disease and propagated through a new strain severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) since December 2019 emerged from Wuhan, China, and this infection has widespread globally that causes to declare public health emergency in the whole world by the WHO. In this article, an attempt was made to recognize natural phytoconstituents from various indigenous medicinal plants, in order to utilize as a source against COVID-19 infections by virtue of molecular docking. The main focus of the study was molecular docking analysis of forty phytoconstituents from plants such as *Tinospora cordifolia*, *Zingiber officinale*, *Azadirachta indica*, *Withania somnifera*, *Glycyrrhiza glabra*, and *Ocimum tenuiflorum* with four different targets of SARS-CoV-2.

AIM AND OBJECTIVE: The aim of the study is to determine binding affinity of phytoconstitutents against different targets of SARS CoV2.

MATERIALS AND METHODS: Molecular docking was performed using VLifeMDS® (version: 4.6. 08032021) and AutoDockTools.

RESULTS: Among forty phytoconstituents based on binding affinity, berberine and vicenin 2 showed the highest potential toward 3-chymotrypsin-like protease enzyme of SARS-CoV-2. Licorice and tinosporide had the potential to bind with the angiotensin-converting enzyme-2 of SARS-CoV-2. Rosmarinic acid also has a binding affinity toward papain-like protease (PLpro) enzyme of SARS-CoV-2. It has been also seen that isoorientin has ability to bind to RNA-dependent RNA polymerase of SARS-CoV-2.

CONCLUSION: Based on docking scores, the phytoconstituents from *T. cordifolia*, *Z. officinale*, *A. Indica*, *W. somnifera*, *G. glabra*, and *O. tenuiflorum* showed a good potential for binding to selected targets of SARS-CoV-2, and the antiviral activity of these plants can be scientifically supported by docking studies.

Keywords:

COVID-19, molecular docking, phytoconstituents, severe acute respiratory syndrome coronavirus 2

Department of Quality Assurance, [1]Department of Quality Assurance, School of Pharmacy, MIT World Peace University, Pune, Maharashtra, India

Address for correspondence:
Dr. Vijaya Sachin Vichare, PES Modern College of Pharmacy (for Ladies), Pune, Maharashtra, India.
E-mail: vicharevijaya11@gmail.com

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Introduction

The new public health pandemic COVID-19 is threatening to the world with the outbreak of novel coronavirus resulting in more than 4.5 million deaths worldwide.[1] It has been declared as a public health emergency by the WHO.[2] In December 2019, a new virus has been

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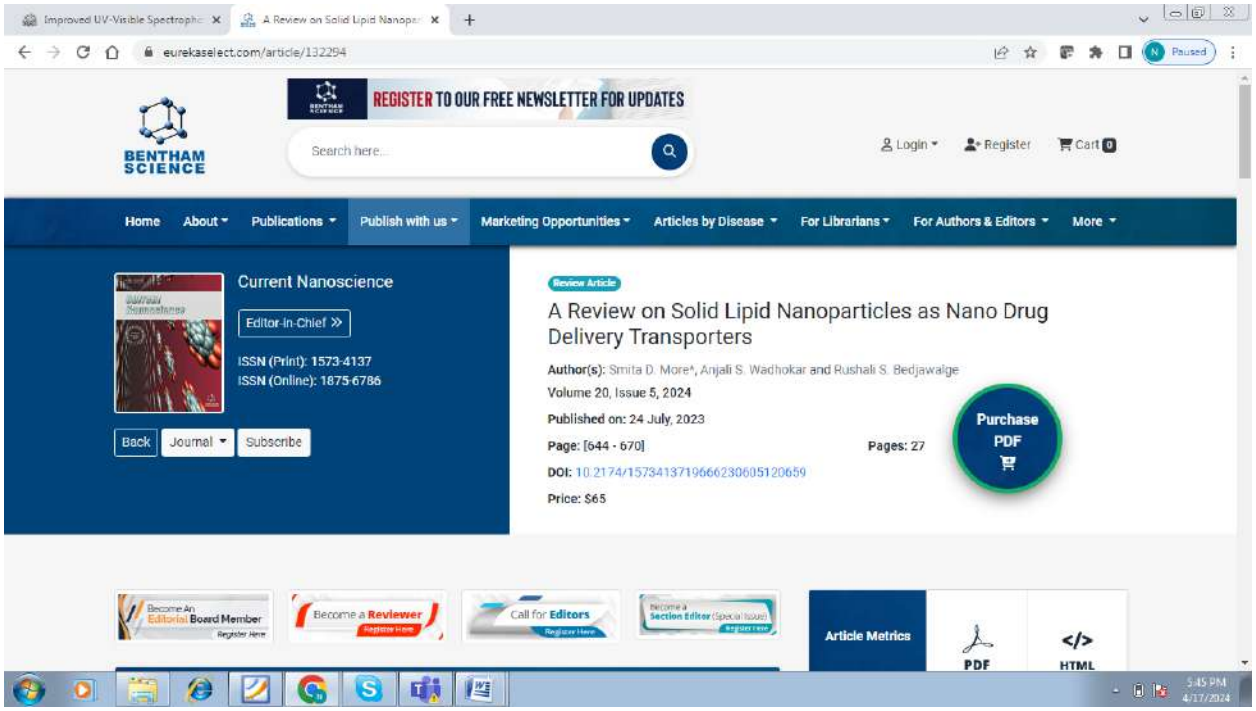

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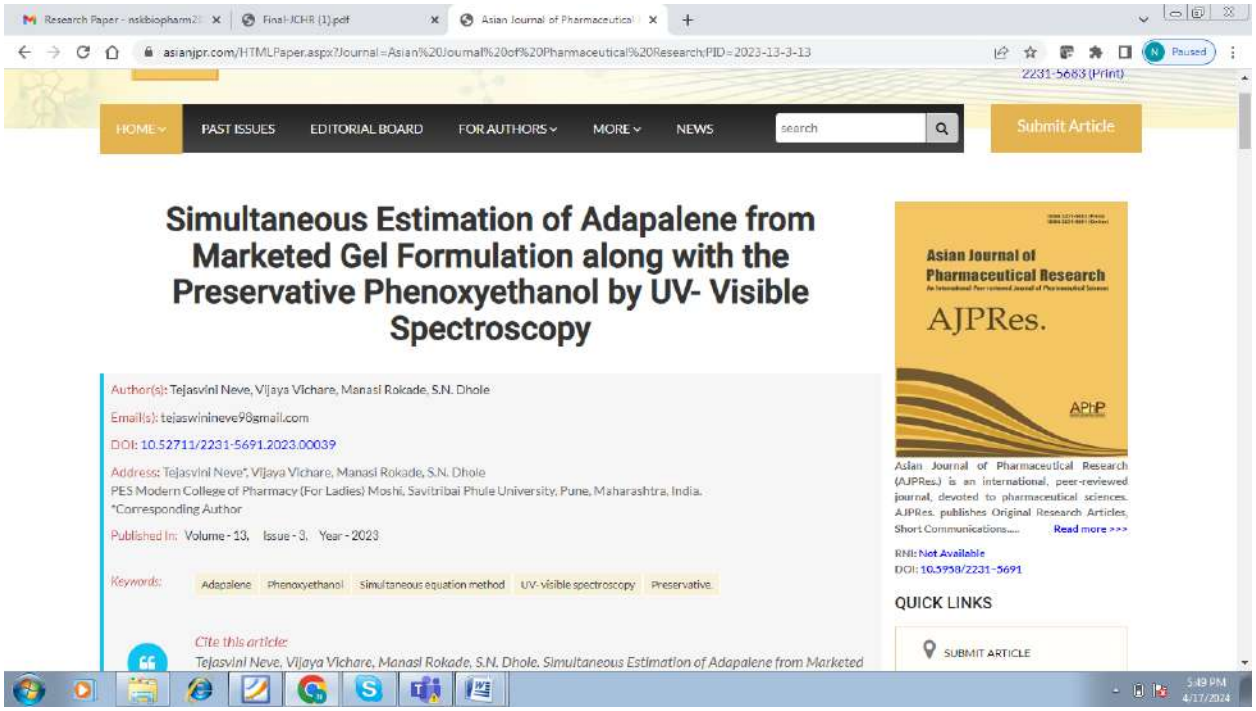

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RESEARCH ARTICLE

Formulation Development and Evaluation of a Polyherbal Suspension Containing *Curcuma longa, Ocimum sanctum* and *Azadirachta indica* with Improved Antimicrobial Activity

R. S. Shivarkar[1,2*], S. B. Bhise[3], V. Rama Mohan Gupta[4], N. S. Kulkarni[1] and M. C. Upadhye[1]

[1]Department of Pharmacognosy, PES Modern College of Pharmacy for Ladies Moshi, Pune - 421105, Maharashtra, India; rahulshivarkar19@gmail.com

[2]Jawaharlal Nehru Technological University, Hyderabad - 500085, Telangana, India

[3]A202, Navkar Residency, Near Bibwewadi Police Chowki, Pune - 411037, Maharashtra, India

[4]Pulla Reddy Institute of Pharmacy, Annaram, Gummudidala, Hyderabad - 502313, Telangana, India

Abstract

A lack of global political will to mobilise resource to fight tuberculosis is major challenge in ending tuberculosis. The polyherbal formulations are best alternative, as they are economic, environmentally friendly and easily available than modern drugs. In present study, a polyherbal suspension with extracts of *C. longa, A. indica* and *O. sanctum* was developed and characterized. The developed suspension was found satisfactory with respect to odour, colour, taste, pourability, pH, viscosity, zero microbial count, particle size, percentage ease of disposability, aesthetic characteristic, sedimentation, zeta potential and does not show the crystal growth, polyherbal formulation exhibited significantly inhibited the growth of H37Rv and MIC is also comparable to those of standard agents.

Keywords: Antimicrobial, Polyherbal Formulation, Tuberculosis

1. Introduction

An estimated 10.6 million people became ill with Tuberculosis (TB) in 2021 compared with 10.6 million who died in 2020 from Tuberculosis as per WHO Report 2022. Relative to 2020, the incidence rate of TB increased by 3.6 in 2021 indicating a 2% decrease annualy[1].

Due to the incidence of Multi-Drug Resistant Tuberculosis (MDR-TB), there is an increase in the death rate in the world since 1980[2]. This situation is due to irregularity in TB treatment and current drug therapy failing to treat the disease. For treatment of MDR-TB second-line drugs have been used which showed side effects with only a 50% cure rate. Moreover, the first line and second line of drugs are costly[3]. Only two new drugs introduced such as Delamanid and Bedaquiline which are found unsafe clinically. Since 2015, there are new cases of MDR-TB and continuous addition of Rifampicin-Resistant TB (RR-TB) in patients with Rifampicin-Resistant TB (RR-TB)[4]. In the case of acquired drug resistance, only second-line drugs must be used but are found equally costlier. Therefore, for the control of TB, there is an immediate requirement for modern methods of drug treatment[5]. Folklore medicine especially natural drugs have proven its potency and found the best

*Author for correspondence

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RESEARCH ARTICLE

Delivery System for Improvement in Solubility of Poorly Soluble Drugs

Aishwarya Jalinder Kharabi[1]*, Chaitali Chandrashekhar Dongaonkar[2], Nilesh Shrikant Kulkarni[3] and Shashikant Nivrutti Dhole[4]

[1]M.Pharm Student, PES Modern College of Pharmacy (for ladies), Moshi, Pune, Maharashtra, India.
[2]Assistant Professor, PES Modern College of Pharmacy (for ladies), Moshi, Pune, Maharashtra, India.
[3]Associate Professor, PES Modern College of Pharmacy (for ladies), Moshi, Pune, Maharashtra, India.
[4]Principal and Professor, PES Modern College of Pharmacy (for ladies), Moshi, Pune, Maharashtra, India.

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***Address for Correspondence**
Aishwarya Jalinder Kharabi
M.Pharm Student,
PES Modern College of Pharmacy (for Ladies),
Moshi, Pune, Maharashtra, India.
E.Mail: aishwarya.kharabi9899@gmail.com

ABSTRACT

Most of the newly evolved drug applicants are lipophilic and poorly water-soluble. Enhancing the dissolution and bioavailability of those tablets is a prime mission for the pharmaceutical industry. Liquisolid method, that is primarily based totally at the conversion of the drug in liquid nation into an seemingly dry, non-adherent, loose flowing and compressible powder, is a unique and superior method to address the issue. The goal of this newsletter is to offer an outline of liquisolid method and summarize the development of its packages in pharmaceutics. Low cost, easy processing and notable potentials in commercial manufacturing are primary blessings of this method. In addition to the enhancement of dissolution price of poorly water-soluble tablets, this method is likewise a reasonably new method to correctly retard drug launch. Furthermore, liquisolid method has been investigated as a device to limit the impact of pH on drug launch and as a promising opportunity to traditional coating for the development of drug photostability in strong dosage forms. Overall, liquisolid technique is a newly evolved and promising device for boosting drug dissolution and maintaining drug launch, and its capacity packages in pharmaceutics are nonetheless being broadened.

Keywords: Liquisolid compact. Liquid vehicle. Carrier. Coating material.

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Section A-Research Paper

Design and Evaluation of Gastroretentive Mucoadhesive Tablet of Antihypertensive

Swapnali S. Pharande[1], Prajakta S. Jagtap[2], Rupendra V. Doshi[2], Poonam S. Sable[3], Arti H. Chandanshive[4], Priti D. Mane-Kolpe[5], Amarja B. Mohite[6], Dipalee J. Vhankade[7], Priyanka B. Parekar[8]

[1]*PES Modern College of Pharmacy (For Ladies) Moshi, Pune, Maharashtra, India 421105*
[2]*DKSS's Dattakala College of Pharmacy, Swami-Chincholi, Pune, Maharashtra, India 413130*
[3]*Srinath College of Pharmcy, Chhatrapati Sambhajinagar, Aurangabad, Maharastra, India 431133*
[4]*SVS College of Pharmacy, Tembhurni, Madha, Solapur, Maharashtra, India 413211*
[5]*DKSS's Dattakala Institute of Pharmacy, Keture, Karmala, Solapur Maharashtra, India 413206*
[6]*Sahyadri College of Pharmacy,Methwade, Sangola,Solapur, Maharashtra, India 413307*
[7]*DKSS's Anusaya Institute of Pharmacy, Swami-Chincholi, Pune, Maharashtra, India 413130*
[8]Chetana Foundation's Chetana College of Pharmacy, Sardewad, *Pune, Maharashtra, India 413106*

***Corresponding Author Address:**
Swapnali S. Pharande
Email ID: swapnali88pharande@gmail.com
Contact: 9552700709

Abstract: For drug delivery due to the simplicity of administration, patient comfort and pliability in the preparation oral drug delivery administration has been the uppermost route. Gastroretentive mucoadhesive tablet of combination of two drugs like Valsartan and Hydrochlorothiazide were prepared by using direct compression technique. Mucoadhesion is a complicated occurrence that includes wetting, adsorption and interpenetration of polymer chains. The formulated tablet of several preparation was characterized during a entire mucoadhesion time, resiliency delay time and percent drug liberation. The several batches were formulated by using a direct compression method utilizing the diversity of mucoadhesive polymers like Carbopol 971, Eudragit RS 100 and exposed to several evaluation variables like in-vitro drug release outline, tablet post compression parameters and physical possessions. The formulated tablet granules are assessed before compression during various parameters such as bulk density, tapped density, angle of repose, compressibility etc. to check the flow possessions of granules. In assessment of Post Compression variables of Gastroretentive high density tablets also various parameters are studied like Weight variation(mg), Friability (%), Hardness(kg/cm^2), Thickness(mm), Drug Content of Valsartan (%), Drug Content of Hydrochlorothiazide (%) etc. The Gastroretentive Mucoadhesive tablet formulation shows best drug release pattern so it is considered as best formulation for the Gastroretentive sustained release drug delivery system. For the sustained release gastroretentive drug delivery system from the evaluation of all types of tablets it is concluded that the Mucoadhesive approach is the best. The stability study of optimized batch of mucoadhesive tablets shows that the formulation is stable.

Keywords: Mucoadhesion, gastroretentive, Valsartan, Hydrochlorothiazide etc.

Introduction

For various hours gastroretentive systems may persist in the gastric area and therefore it may remarkably extend an abdominal residence time of drugs. The bioavailability enhances when extend

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Formulation of Novel Silver Nanoparticles (Snps) Using Fungal Endophyte Macrosporium Fasciculatum and Evaluation of Their Antimicrobial Potential

[*]Dr. Savita Shrikant Deokar[1], Dr. Rajesh Ramesh Patil[1], Ms. Survanta R Takale[1], Mrs. Harshada H. Puranik[1], Mr. Pranit B. Kale[2], Ms. Pooja Nitin Maid[3], Dr. Rahul Shashikant Shivarkar[4]

1. Assistant Professor, Pimpri Chinchwad University (School of Pharmacy), Sate Maval, Pune Maharashtra, India-412106
2. Research Scholar, Apex University, Jaipur, Rajasthan-302018
3. Assistant Professor, Dr. D.Y.Patil Institute of Pharmaceutical Sciences and Research, Pimpri, Pune Maharashtra, India-411018
4. Assistant Professor, PES, Modern College of Pharmacy for Ladies, Moshi, Pune Maharashtra, India- 412105

***Corresponding Author: Dr. Savita Shrikant Deokar Assistant Professor, Pimpri Chinchwad University (School of Pharmacy), Sate Maval, Pune Maharashtra, India -412106**
Email Id: savita.deokar@pcu.edu.in

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KEYWORDS
Novel silver nanoparticles (SNPs), Fungal Endophyte, Antimicrobial activity.

ABSTRACT

There is an increasing commercial demand for nanoparticles due to their wide applicability in various areas such as electronics, catalysis, chemistry, energy, and medicine. Metallic nanoparticles are traditionally synthesized by wet chemical techniques, where the chemicals used are quite often toxic and flammable. In this work we have investigated extra cellular biosynthesis of novel silver nanoparticles using fungal extract of recently isolated novel endophytic fungus *Macrosporium Fasciculatum*. The synthesis process was quite fast and silver nanoparticles were formed within minutes of silver ion coming in contact with the cell filtrate. UV–visible spectrum of the aqueous medium containing silver ion showed a peak at 420 nm corresponding to the plasmon absorbance of silver nanoparticles. Transmission electron microscopy (TEM) micrograph showed formation of well-dispersed silver nanoparticles in the range of 10–30 nm. The process of reduction being extra cellular and fast may lead to the development of an easy bioprocess for synthesis of novel silver nanoparticles. Development of reliable and eco-friendly process for synthesis of metallic nanoparticles is an important step in the field of application of nanotechnology. Further these biologically synthesized nanoparticles were found to be highly toxic against different bacterial and fungal species. The most important outcome of this work will be the development of cost effective, nanoparticles based medicines from *Macrosporium Fasciculatum*for the treatment of microbial diseases. This is for the first time that *A. alternate* fungal extract was used for the synthesis of novel silver nanoparticles.

INTRODUCTION

Increased industrialization and urbanization has damaged the environment by introducing a number of harmful and unwanted substances. These metal–microbe interactions have important role in several biotechnological applications including the fields of bioremediation, bio mineralization, bioleaching and microbial corrosion. The field of nanotechnology is one of the most active areas of research in modern material sciences. Nanoparticles exhibit completely new or improved properties based on specific characteristics such as size, distribution and morphology. Nanotechnology is a field that is burgeoning day by day, making an impact in all spheres of human life. New applications of nanoparticles and nano materials are emerging rapidly. Nano crystalline silver particles have found tremendous applications in the field of high sensitivity bio molecular detection and diagnostics, antimicrobials and therapeutics, catalysis and micro-electronics. However, there is still need for economic, commercially viable as well environmentally clean

ORIGINAL ARTICLE

Development of Fast-dissolving Oral Dosage Form as Tablet using Binder as *Vigna Mungo* Mucilage and Oral Film using Solvent Casting Technique: Comparative Study

Nilesh S. Kulkarni[1], Vidyaranee B. Ingle[1], Shashikant N. Dhole[1], Rahul H. Khiste[2], Rahul S. Shivarkar[1], Manoj K. Munde[3]

[1]Department of Pharmaceutics, PES Modern College of Pharmacy (For Ladies), Moshi, Pune Affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India, [2]Department of Pharmaceutical Quality Assurance, Marathwada Mitra Mandals College of Pharmacy, Thergaon, Pune affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India, [3]Department of Pharmaceutical Chemistry, Raigad College of Pharmacy, Mohpre Mahad, Raigad Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Maharashtra, India

Abstract

Aim: Oral route is the most common route of delivery which is used for drug administration. Oral solid dosage forms are the most preferred oral dosage forms as tablets and novel drug delivery as oral films. Sumatriptan succinate is a new generation anti-migraine agent; Oral bioavailability of sumatriptan succinate is low due to its severe first-pass metabolism. **Materials and Methods:** An attempt was made to develop fast-dissolving and disintegrating oral tablet and oral film for the sumatriptansuccinate to avoid first-pass metabolism. To develop a fast-dissolving tablet a natural mucilage powder extracted from *vigna mungo*. The tablet formulations were prepared using 2, 4, and 6% mucilage solution as a binder. Similarly, the oral films containing polyvinyl alcohol: soluplus or hydroxypropyl methyl cellulose: Soluplus were prepared by solvent casting method. The differential scanning calorimetry and fourier transform infrared spectroscopy was carried out for plain drugs, blend of drugs with mucilage, formed granules andoral film. The developed oral fast-dissolving tablet and oral fast-dissolving film formulations were evaluated for drug content, *In vitro* dissolution study. **Results and Discussion:** Tablets formulated with 2% mucilage (B1) binder require less disintegration time and 100% drug dissolution within 10 min. Film formulations containing HPMC K100M with soluplus containing 100 mg and 675 mg, respectively, resulted disintegration within 25 seconds and 96% of drug dissolution within 5 min. **Conclusion:** Hence, the fast-dissolving dosage form was successfully developed as film formulation as compared to tablets for the sumatriptan succinate.

Key words: First pass metabolism, mucilage, oral film

INTRODUCTION

Large advancements and developments in the region of pharmaceutical dosage forms have been seen over the last few decades. Solid dosage forms are most preferred oral solid dosage forms are popular and among them, tablets are mostly used. To avoid experiencing difficulty in swallowing oral solid medicament by geriatric and pediatric patients, patients who are suffering from illnesses that cause difficulty in swallowing, and bedridden patients. Advancement and development are also required to obtain faster and instant action of medicament and to overcome problems related to bioavailability. To overcome or minimize disadvantages some sort of modification is needed. International oral dosage form for gaining that desired effect for the intended onset of action

Address for correspondence:
Dr. Nilesh S. Kulkarni, Department of Pharmaceutics, PES Modern college of Pharmacy (For Ladies), Moshi, Pune, Maharashtra, India. E-mail: nileshpcist@gmail.com

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Review Article

A Comprehensive Review on Novel Lipid-Based Nano Drug Delivery

Sonam Suresh Godase, Nilesh Shrikant Kulkarni*, Shashikant Nivrutti Dhole

Department of Pharmaceutics, PES Modern college of Pharmacy (for ladies) Moshi, Pune. Affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India.

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Keywords:
Novel Drug Delivery System, BCS classification, Liposome, Niosomes, Solid lipid nanoparticles, Nanochochleats

Abstract
Novel drug delivery system opens the doors towards nano/micro formulation strategies to overcome the challenges associated with the poorly soluble and permeable drugs. Lipid based nanoparticles are widely accepted that includes liposomes, niosomes and micelles which are FDA approved. Such lipid based drug delivery allows delivery for natural phytoconstituents, biopharmaceutical classification system (BCS) class II and class IV drugs are effectively delivered to improve its solubility, permeability and bioavailability. The article provides the recent advances and application of lipid based dosage form for improvement of therapeutic efficacy.

Introduction

Novel drug delivery system opens the doors towards Nano/Micro formulation strategies to overcome the challenges associated with the biopharmaceutical classification system (BCS) class II and class IV drugs.[1] Such medication or drug delivery targets the drug at required site that too in low concentration and improves therapeutic efficiency. Novel drug delivery system includes microparticles, nanoparticles such as lipid based liposomes, niosomes, phytosomes, micelles, hydrogels, quantum dots, nanotubes, dendrimers etc.[2] Nanoparticulate drug delivery system have particle size which ranges between 1 to 100 nm. The drug movement across the barrier will get improved due to development of nanosized particulate system.[3] Nanomaterials have wide application in the treatment and diagnostic purpose.[4,5]

Currently lipid based dosage forms are popular that includes liposomes, niosomes, micelles etc which are FDA approved. Such lipid based drug delivery systems have found to be effective for natural phytoconstituents and inorganic particles like gold.[6] The advantages of lipid based novel drug delivery system are associated with the majority of drugs.

Reasons for application of novel drug delivery system for BCS class II and IV drugs.[7-11]

1. Poor solubility and poor permeability of drug.
2. Decrease in size of particle leads to increase in effective surface area which ultimately improves dissolution rate of poorly soluble drugs.
3. Nanomaterials are being used in many different biological and medical fields because they reframe optical, electrical, chemical and physical properties.
4. Increases mobility of particle that helps to increase bioavailability.
5. Nanomaterials have application in targeted and controlled delivery of biopharmaceuticals.
6. Due to nanosized structure, it can easily cross mucosal membrane whereas Microsystems has capacity to cross epithelial lining.
7. Increased drug therapeutics efficacy and reduced side effects.
8. Protection of drug from first pass metabolism and enzymatic degradation.

Solubility and permeability

Solubility is one of the key parameter that directly affects the activity and bioavailability of drug. The variety of factors that has influence on solubility of the drugs are pKa of drug, pH at gastrointestinal tract (GIT), presence of luminal pH.[12,13] Physiological and physicochemical factors have influence on drug solubility.[14,15]

Solubility depends on chemical, electrical, structural properties of the solute and interaction between solute solvent. The USP 38, European pharmacopoeia categorized solubility in seven different group.[16] Biopharmaceutics classification system was developed

*Corresponding Author: Nilesh Shrikant Kulkarni, Email: nileshpcist@gmail.com

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REVIEW ARTICLE

A Review on recent approaches for the use of different Analytical Techniques to Analyze some Calcium Channel Blockers and their Combinations with other Antihypertensive Drugs

Saylee Ganorkar[1], Nilesh Kulkarni[2] and Rahul Khiste[1,*]

[1]*Department of Pharmaceutical Chemistry, Marathwada Mitra mandal's College of Pharmacy, Thergaon, Pune 411033, Maharashtra, India*
[2]*Department of Pharmaceutics, Progressive Education Society's PES Modern College of Pharmacy (For Ladies), Moshi, Pune 412105, Maharashtra, India*

Abstract:

Background:

Diabetes, high cholesterol, and high blood pressure all considerably raise the risk of cardiovascular disease. When all three of these characteristics occur at once, a metabolic problem is postulated. A combination of antihypertensive, hypolipidemic, and anti-diabetic medications is frequently utilised to treat cardiovascular diseases. While statins (fluvastatin, simvastatin, *etc.*) are used to lower cholesterol levels, calcium channel blockers (*e.g.* amlodipine, efonidipine, and azelnidipine, *etc.*) are used to target the smooth muscles of the heart. Diuretics (*e.g.* chlortalidone, hydrochlorothiazide, *etc.*) and angiotensin II receptor antagonist (blockers) are also used to manage high blood pressure.

Objective:

The study aimed to review liquid chromatography and related high-performance (HPLC) techniques that have been developed and used for evaluating the above drugs, together with an overview of the research work published in various scientific and drugs-linked journals.

Results:

A basic critical investigation of the detailed published information has been completed and the current status of HPLC and related techniques as a percent measure of calcium channel blockers has been examined.

Conclusion:

This survey has explored several matrices, including pharmacological products and organic samples, as well as methods for examining direct calcium blockers in them. It also discusses the current state of calcium channel blocker stability investigations. Additionally, it offers scientific approaches for the concurrent estimate of angiotensin II receptor antagonism, diuretics, statins, and beta-blockers with calcium channel blockers.

Keywords: HPLC, Azelnidipine, Efonidipine, Cilnidipine, Calcium channel blockers (CCBs), Diabetes.

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1. INTRODUCTION

Hypertension is a regular, ongoing, age-related problem, which frequently involves weakening cardiovascular and renal entanglements. Pulse is normally noted in blend with other cardiovascular factors. Hypertension is associated with other cardiovascular factors, for example, stomach weight, dyslipidemia, diabetes, hyperinsulinemia, and hyperuricemia, which are typical fundamental reasons. Hypertension progressively depends on computerized procedures of circulatory strain estimation. Antihypertensive medication treatment decreases the complications of hypertension. Historically, doctors have prescribed calcium channel blockers to manage hypertension and prevent angina. A common therapy option for hypertension is a group of medications known as dihydropyridine calcium channel blockers, which also include amlodipine, felodipine, and lacidipine.

Dihydropyridine calcium channel blockers (CCBs) act by loosening up vascular smooth muscle, widening veins and thus diminishing fringe obstruction. Benzothiazepines (such as

* Address correspondence to this author at the Department of Pharmaceutical Chemistry, Marathwada Mitra mandal's College of Pharmacy, Thergaon, Pune 411033, Maharashtra, India; E-mail: rahulkhiste@yahoo.com

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