International Journal of Research in Pharmacy and Pharmaceutical Sciences
www.pharmacyjournal.in
ISSN: 2455-698X
Received: 24-04-2023, Accepted: 10-05-2023, Published: 25-05-2023
Volume 8, Issue 2, 2023, Page No. 86-89

Formulation development and evaluation of antidiabetic oral in-situ gel: A research

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Abstract
The present research was focused to improve and develop the formulation to release the drug syzyium cumini leaves as well as other natural drugs like aloevera, turmeric, fenug Fenugreek seed powder. The In-situ gel formulations were used to improve or enhance the patient compliance. HPMC50cps, carbopol 934 is used in this as a polymers. The concentration of the polymer is very important for drug release.so the drug release varied from the concentration of polymers. carbopol, HPMC HPMC50CPS used in various combination forms. The viscosities of the preparation or our samples were measured by Brookfield viscometer. The drug polymer interactions were evaluated by using UV spectroscopy. syzygium cumini leaves is an oral antidiabetic agent used in treating a diabetes mellitus.
The plant is rich in compounds containing anthocyanins, glucosid glycoside, ellaguc acid, isoquercetin, kamperol and myrecetin etc it have less side effects and promote the health and healing of patients.

Keywords: syzyium cumini leaves, Turmeric, Fenu Fenugreek seed powder, and Alovera.HPMC50cps, carbopo carbopol 980, simpl simple mixing method, oral In-situ Gel, controlled release drug delivery system. etc

Introduction
Controlled drug delivery system is the system which delivers the fixed rate for locally or the systematically for specific time.[1] Oral CRDDS is a system which includes the delivery of drug at accountable and duplicatable kinetics for determined period throughout the Span of GIT [3]. An ideal oral drug delivery system should relentlessly convey a measurable and reproducible amount of drug to the target site over a prolonged period.

Insitu Gels
The term insitu is a latin word which means “In position”. Insitu gels are the drug delivery system that are initially in solution form before administration into the body, but when administered it undergoes gelation in situ, forming the gel [4]
Advantages
- They increases contact time,
- Improvcs local bioavailability,
- Patient compliance and comfort,
- Reduces dosing frequency,
- Reduces dose concentration, Production is less complex and thus lowers the investment and manufacturing cost.

Diabetes Mellitus
Diabetes mellitus is a group of metabolic diseases in which a person has high blood sugar over prolonged period of time. It is either because the body does not produce enough insulin or because cells do not respond to the insulin that is produced [7]
This high blood sugar shows symptoms such as polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger) [7] There are three main types of diabetes.

Type 1 diabetes: results from the body's failure to produce insulin, and there the person requires to inject insulin. (Referred as insulin-dependent diabetes mellitus or juvenile diabetes.)

Type 2 diabetes: results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency. (Referred as non-insulin-dependent diabetes mellitus or adult-onset diabetes.)* Gestational diabetes: is when pregnant women, who have never had diabetes before, have a high blood glucose level during pregnancy. It may precede development of type 2 diabetes mellitus.

Introduction of Drug
1. Syzyium cumini leaves

Fig 1

Fig 2

Biological source
Syzygium cumini is a big tree home grown from Indian supercontinent, but widely cultivated in many countries in Africa, Asia, and South America. It is popular in India known as jamun in India, black plum in Europe, jambolan in Spanish-spoken countries.and other name in other countries.

Family: Myrtaceae
Phytochemical constituents
It contains Various secondary metabolites *viz.*, flavonoids, phenolic acids, tannins, and terpenes have been reported in different parts of S. cumini. For instance, leaves of this plants contain high levels of flavonoids, especially quercetin, myricetin, myricitrin, kaempferol, and their glucoside derivatives, in addition to simple phenols like ellagic acid, ferulic acid, chlorogenic acid, and gallic acid.The essential oil of leaves is prevalent in terpenes such as α-pinene, β-pinene, α-limonene, α-cadinol, pinocarvone, pinocarveol.The seeds are the most useful part of the plant, it contains high in hexahydroxy diphenic (HDDP) acid-derivated hydrolysable tannins, terpenes like as α-terpineol, eugenol etc.

Use of syzygium cumini
The leaves of the syzygium cumini contain a number of chemical constituents that are used to have antihyperglycemic, antihyperlipidemic, and antioxidant properties. and thus are beneficial against these maladies.
The bark is pungent, sweet, digestive, styptic to the bowels, anthelmintic and used for the treatment of sore throat, bronchitis, asthma, thirst, dysentery and ulcers. It act as a good blood purifier.

Side effects of syzygium cumini
Diarrhea. Gas (flatulence). Skin ulcers, when applied to the skin. used as gargle but it cause sore throat.

2. Aloevera

Fig 3

Biological source
The Alovera have the synonym is Kumari, Aloe etc.it is obtained from the Dried juice of leaves of Aloevera, Aloe barbadensis, Aloe ferox,

Family: Liliaceae
Phytochemical constituents

Fig 4

Aloe vera leaves contain chemical constituents Barbaloin, aloe-Emodin, such as lignans, phytosterols, polyphenols, anthraquinone C-glycosides, anthrones, and other anthraquinones derivatives, such as emodin and various lectins.

Use of Alovera
Aloe is used topically (applied to the skin) and orally. Used as purgative, laxat laxative, antidiabetic Topical use of aloe is promoted for acne, lichen planus, oral submucous fibrosis, burning mouth syndrome, burns, and radiation-induced skin toxicity.

Side effects of Alovera
Aloe taken orally might be not safe and is likely not safe in high doses. Taking few grams or in few quantity in a day of aloe latex for several days can cause acute kidney failure and can be fatal. Aloe extract might also cause cancer. Other side effects include abdominal cramps and diarrhea.

3. Turmeric

Fig 5

Biological source
Turmeric consists of dried as well as, fre fresh rhizomes of plant known as curcuma longa Linn.

Family: zingiberaceae
Phytochemical constituents

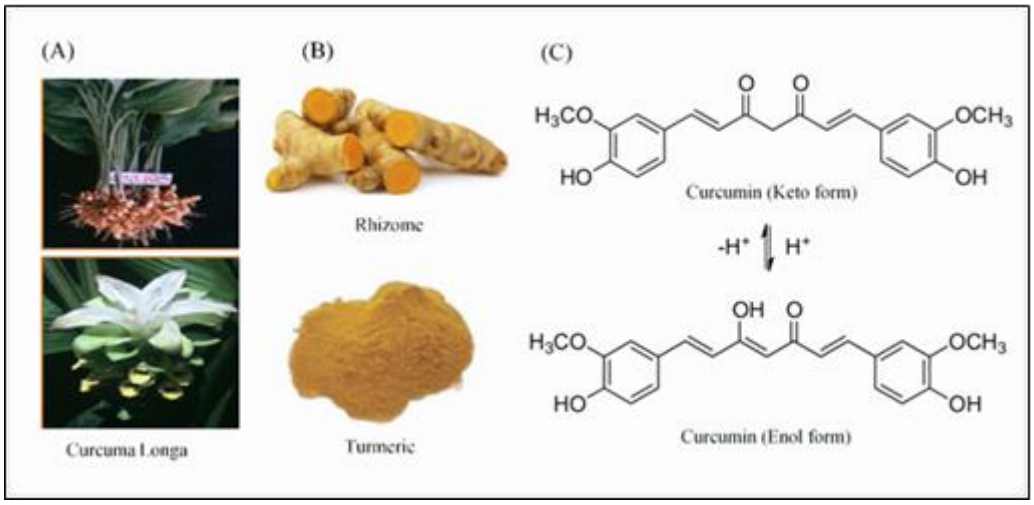

Fig 6

Turmeric contains volatile oil,resin, zingiberaceous starch grains and yellow substances known as cucuminoids. The main component of curcuminoids is known as cucumin.and other chemical constituents are Tumerone, zingiberene, caprylic acid etc.

Use of Turmeric

Turmeric is used as a antiseptic, expectorant. a condiment or spice, and colouring agent, especially for ointment and Creams. chemically used to detect the boric acid. Antidiabetic. etc

Material and methods

Profiles of materials used

jamun leaves was obtained from the plant of syzyium cumini family myrtaceae. it is world wide medicinal plant.it contains a kamperol, myricet myrecetin, querce quercetin and their glycosides. and we also use polymers like carbopol 934 HPMC50cps and aloevera. aloevera also act as preservatives.

Methodology

Preparation of oral Insitu gel

Simple mixing method

Different formulations were prepared by using syzyium cumini leaves and other natural drugs. for many experiments. In this make a polymeric solution by dispensing required polymers then the quantity of drug powder mixed into poymeric solution and properly mixed by magnetic stir until uniform solution obtained.2 mg of turmericnd other natural drug powder was solubelized in deionised water with continuous stirring until uniform solution obtained. To the polymer solution, drug solution was added. and the above prepared solution 6.8PH buffer was added.there we can observe solution to gel transformation. The formulation prepared were shown in

Table 1

Drug name	Amount of drugs in mg	Carbopol	HPMC 50cps	Solvent
Syzygium cumini	6 gm	0.5 gm	0.25 gm	10 ml
Aloe	25 gm	0.5 gm	0.25 gm	10 ml
Turmeric	5 gm	0.5 gm	0.25 gm	10 ml

Evaluation parameters

1. Physical appearance

All the formulation which was prepared were evaluated for clearness by visual inspection against a black and white background.

2. PH

The pH of prepared formulations was determined using a calibrated pH meter at room temperature. The measurement is carried out in triplicate and average values are taken.

3. Gelation time

The gelation time is the time taken by solution to get converted in to gel in approving conditions and was determined by adding the polymeric solution containing the drug into the 6.8 pH buffer, it was observed for seconds the solution transformed into a gel when it comes in contact with the buffer. As the formulation came in contact with 6.8 pH buffer, it interchanged from solution to gel and the time was noted properly.

4. Rheological behaviour

The viscosities of the different formulations were determined by use of Brook field viscometer. The samples were sheared at a rate of 100 rpm using spindle no 64 at room temperature. Viscosity estimation for each sample was performed in three steps, and average was select.

5. Swelling index

10 ml formulation was prepared and weighed properly (W1). It was reserved in a beaker and 10 ml of 6.8pH phosphate buffer was added. The beaker was keep a side for 24 hrs. The weight of swollen matrix gel (W2) was found and swelling index was calculated by following formulae: Swelling Index = (W2- W1/W1) × 100Where, W1 = initial weight of gel (100 mg), W2 = weight of bloated matrix after 24 hrs.

6. Mucoadhesive strength

A modified balance was used for measuring the ex *vivo* mucoadhesive strength. Fresh sheep intestinal mucosa was obtained from a local slaughterhouse (Small intestine mucosa was used as model membrane since the intestine provides flat and uniform surface, and used within 2 hours of slaughter. The mucosal membrane was isolated by removing underlying fat and loose tissues. The membrane

was washed several times with distilled water and then with phosphate buffer 6.8 solutions. The sheep intestinal mucosa was cut into different parts and washed with phosphate buffer pH 6.8. A piece of intestinal mucosa was tied to a glass vial; the vial was tightly fitted into a glass beaker filled with phosphate buffer pH 6.8 so that it just touched the mucosal surface. The formulated gel stuck to the lower side of a glass stopper. Both sides of the balance were made equal before examining, by keeping a 5g weight on the right-hand pan. A weight of 5g was taken off from the right-hand pan, including the gel over the mucosa. The balance was kept in this position for 2 minutes contact time; a force was applied to the left pan of balance by adding water dropwise to the beaker till of gel achieved. The mucoadhesive strength shows the amount of water added minus the weight of the preload, and the mucoadhesive force was calculated from the following equation: Mucoadhesive Force = mucoadhesive strength x 0.0098 mucoadhesive strength determination.

Determination of Absorption Maximum (Λmax)

UV spectrum of syzygium cumini. UV-Scan Spectrum Performed at Range 200.00 to 350.00 nm showed maximum absorbance at 270nm wave-length. The calibration curve of syzygium cumini by plotting concentration against absorbance results in a straight line, and Better peak response and less placebo interference were observed at 264 nm. Therefore, wavelength of 264 nm, it was preferred to estimate the drug.

Results and discussion

Parameters	Result
Colour	Green
Odour	Sweet, Aromatic
PH	4.7-5.2
Physical appearance	Clear appearance
Rheology study	192-1083pa.s
Mucoadhesive strength	13.34-20.84(g)
Swelling index	Greater
Gelation time	30-60sec
Absorption maximum	264

Conclusion

The aim of the study was to formulate develope and evaluate antidiabetic oral In-situ Gel. Diabetes is the most common disorder; for the management of diabetes many anti-diabetic drugs are available in the market in solid dosage forms. But some are convenient or some are not convenient. So Many natural drug formulation is an oral anti-diabetic agent, which is used in treating of type – II diabetes mellitus. The biological half-life of of preparation was a maximum 3 h and is eliminated rapidly. The optimized formulation Thereby, the 2% concentration of syzygium cumini and other drugs like Alovera, Turmeric along with HPMC c50 and Carbopol-934 had shown an extended period of drug release for above 12 hours. The in-*vivo* drug release studies and x-ray studies also confimed that the optimised formulation showing extended bioavailability as above 12 h. Hence it is concluding that the main objective of the study to increase its bioavailability of Formulation as a convenient dosage form in the treatment of diabetes mellitus had been achieved.

Acknowledge

I would like to thank to my guide Respected K.T. Sul madam for permitting me to this Research article. and also thank to my Friends & other teacher staff.

Reference

1. Nandita G. Das, Sudip K. Das. Controlled release of oral dosage forms.
2. Madan M, Bajaj A, Lewis S, Udupa N, Baig JA. In-situ forming polymeric drug delivery systems. Ind J Pharm Sci,2009:71(2):242-51.
3. Nirmal HB, Bakliwal SR, Pawar SP. In-situ gel: new trends in controlled and sustained drug delivery system. Int J PhamTech Res,2010:2(2):1398-408.
4. Himanshu G, Arti S, Birendra S. Pluronic and chitosan based in-situ gel system for periodantal application. Asian J Pharm Sci. 2009, 94-6.
5. Jaya raj KK, Jayachandran E, Srinivas GM, Giridhar B, Rahul N, Jayakandan M. A Novel thermo-sensitive sol-gel reversible buccal adhesive property of fluconazole in situ gel for oral thrush. J Biomed Sci and Res,2010:2(2):100-9.
6. Patel RP, Dadhani B, Ladani R, Baria AH, Patel J. Formulation, evaluation and optimization of stomach specific in situ gel of clarithromycin and metronidazole benzoate. Int J Drug Deliv,2010:2:141-53.
7. Miyazaki S, Endo K, Kawasaki N, Kubo W, Watanabe H, Attwood D. Oral sustained delivery of paracetamol from in situ gelling xyloglucan formulations. Drug Del Ind Pharm,2003:29(2):113-9.
8. Rozier C, Mazuel J, Grove B, Plazonnet. Gelrite: a novel ion activated in situ gelling polymer for ophthalmic vehicles. Effect on bioavailability of timolol. Int J Pharm,1989:57:163-8.
9. Mitesh Kumar J Patel. Strategy for development of pH triggered floating in-situ gel of Levetiracetam. Am J Pharm Tech Res,2012:2(3):828-41.
10. Wamorkar V, Varma MM, Manjunath SY. Formulation and optimization of in situ gel of metoclopramide using 32full factorial design. J Pharm Res,2011:4(8):2780-83.
11. Patel DM, Patel DK, Patel CN. Formulation and evaluation of floating oral in situ gelling system of amoxicillin. Int Scholarly Res Network,2011:8:1-8.
12. Jayswal BD, Yadav VT, Patel KN, Patel BA, Patel PA. Formulation and evaluation of floating in situ gel based gastro retentive drug delivery of Cimetidine. Int J For Pharm Res Schol,2012:9(1):327-37.
13. Luana P, Valeria A, Daniela R, Stefano G. Novel mucoadhesive buccal formulation containing metronidazole for the treatment of periodontal disease. J Control Rel,2004:95:521-33.
14. Steinberg, Michael F. Eds. In. Drug Delivery Devices, Fundamentals and Applications, Tyles, 32, Marcel Dekker, Inc, New York, 1988, 492.
15. Sreeja CN, Anoop KR. Intrapersonal pocket: An ideal route for local antimicrobial drug delivery. J Adv Pharm Tech Res,2012:3(1):9-15.