IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

Formulation and Evaluation of Oral Thin Film of Lidocaine Hydrochloride

Sakshi Santosh Bhore, Shubham Chandrakant Gadge, Nikita Sudam Waphare, Rohan Kashinath Vide, Nikita Rajendra Thorat
Samarth Institute of Pharmacy, Belhe, Pune, Maharashtra

Abstract: *The easiest, safest, and utmost applicable system of administration is buccal delivery. In orderto give specifics systemically, it might be utilised as a cover for the oral route. medicine delivery through the oral depression appears to be made possible by bilayered oromucosal film medications, or buccal flicks. With regard to the treatment of diseases affecting the oral mucosa, particularly mucositis, this study concentrated on flicks for target drug delivery. Creating and developing oral presto- disintegrating flicks with lidocaine to treat mouth ulcers was the thing of the current study. also, the expression's original anaesthetic effect was assessed using the tail film test in a rat model. Fast- dissolving medicine- delivery systems were first developed in the late 1970s as an volition to tablets, capsules, and bathos for pediatric and senior cases who witness difficulties swallowing traditional oral solid- lozenge forms.*

Keywords: Bilayer oralmucosal, emphasized, buccal films, lidocaine Hydrochloride

I. INTRODUCTION

The medicine administration via the oral route is the utmost Preferred route because it's characterized by patient Adequacy and compliance, its ease of administration, its non- invasiveness, its rigidity, great stability, cure delicacy and Modified medicine release profile leading to protract or delay the medicine effect, as well as to enhance medicine release. Difficulty with swallowing, Which occurs in senior or pediatric cases is one of these Problems. Problems swallowing specifics are more common in senior and Paediatric cases, as well as itinerant cases who don't have access to water. therefore, oral contraceptives snappily surfacedin the 1970s as an Indispensable to tablets, capsules, and bathos for children and grown-ups who had difficulty swallowing food in the mouth. The preface of ODT in The request is associated with advising cases on applicable lozenge by Giving instructions similar as " do notchew/ do not swallow ". still, Despite these guidelines, cases involving biting and swallowingare still Reported. The oral disintegrator lozenge form consists of a dissolving oral Tablet anda rapid-fire- dissolving film.

Due to the fast onset of action and the intermediate duration of efficacity of lidocaine, it's generally used as a original anesthetic in Dental surgeries. Lidocaine has been used to treat themouth Ulcers due to its excellent original anesthetic effect that leads to Relieve the pain of the mouth ulcer. OFs of Lidocaine are a Unique system for the mouth ulcer treatment and may act as a cover to ointments, mouth wetlands and gels for pain relief of Oral ulcers. These flicks release lidocaine veritably fleetly at the point of action. also, these flicks are veritably easy to be used and are Suitable for senior, pediatric, bedridden cases.

DOI: 10.48175/568

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

Advantages

1. Ease of Organization: ODFs break down rapidly in the mouth without The require for water, making them helpful for people with Trouble gulping or those on the go.
2. Quick Onset of Activity: The film's fast deterioration permits for Speedier retention of the dynamic fixings, driving to a faster onset of Helpful effects.
3. Made strides Understanding Compliance: ODFs are regularly more tasteful than conventional Dose shapes, possibly improving understanding adherence to endorsed regimens.
4. Accurate Dosing: The films are typically pre-dosed, minimizing the risk of Dosing errors associated with traditional oral forms like tablets or capsules.

Disadvantages-

1. Eating and drinking can be prohibited.
2. High doses cannot be incorporated.
3. Excessive bitter drugs are not feasible.
4. Dose uniformity is a technical challenge.
5. They require uncommon bundling for the items solidness and safety
6. Drugs which aggravate the verbal mucosa cannot be managed by this
7. The Ideal Characteristics of Drug To Be Selected.
8. The drug should have pleasant taste. The drug should have small Molecular sizeand low molecular weight.
9. It should be partially unionized at the pH of oral cavity.
10. The drug should exhibit low sensitivity to environmental conditions.
11. It should have the ability to permeate oral mucosal tissue.
12. The therapeutic dose of the drug should not be greater than 40mg.

Component of film arrangement :-

For the planning of polymeric movies containing drugs, drugs Were broken up in the polymer arrangement earlier to casting. The Concentration of solute is exceptionally critical in planning of the Polymer framework. The arrangement was kept at room temperature for 24 hrs. In arrange to improve interpenetration of polymer particles. Upon drying, polymer arrangementswere changed over into sedate Polymer movies. Different inquire about bunches have considered the Instrument of film arrangement from polymer scatterings .

Selection of Ingredients:-

Film-forming agents: Hydroxypropyl methylcellulose (HPMC), polyvinyl alcohol (PVA), or pullulan are commonly used.

Plasticizers: Such as glycerin or propylene glycol to impart flexibility andelasticity to the film.

Sweeteners and flavoring agents: To mask the bitter taste of lidocainehydrochloride, options include sucralose, mint flavor, or fruit flavors.

Preservatives: If necessary, to maintain the stability of the formulation.

Preparation of the Solution:

Dissolve lidocaine hydrochloride in water or a suitable solvent.

Mix in the film-forming agent, plasticizer, sweeteners, flavoring agents, and any other additives while stirring continuously until a homogeneous solution isobtained.

Casting the Film:

Pour the solution onto a clean, flat surface like a glass plate or mold.

Spread the solution evenly using a spreader or similar tool to achieve the desired thickness.

Drying:

Allow the cast film to dry at controlled temperature and humidity conditionsto form a thin film

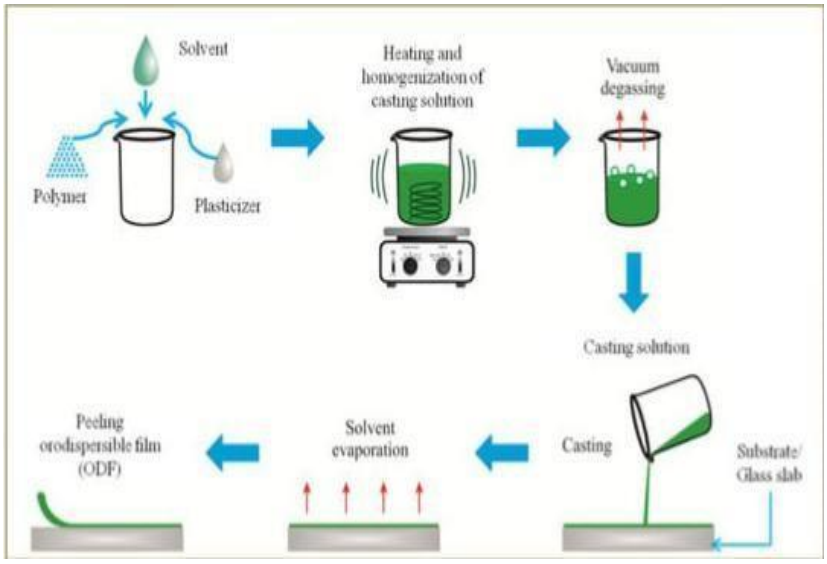
Formulation of Fast Dissolving Films include various ingredients for its formulation

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

Active pharmaceutical ingredient
Film forming polymers
Plasticizer
Superdistegrants
Sweetening agent
Saliva stimulating agent
Surfactants
Coloring agent.

Flavouring agentAgent Concentration:-

1 Drug 1-25%
Water soluble polymer 40 -50%
Plasticizers 0-20%
Fillers, colours, Flavours 0-40%



Active Pharmaceutical Ingredient

The film composition contains 1-30% active ingredient w/w. Always use small Doses ofeffective medications, as higher doses are difficult to integrate into the Film quickly. Antibiotics, antibiotics, antibiotics, vasodilators, antibiotics, etc.

Film Forming Polymers

A variety of Polymers are available for the preparation of oral films and are used in amounts Of approximately 40-45% w/w of the total film weight, but can be increased Individually or together up to 65% w/w film weight.The resulting film must be sturdy enough to not cause Damage during handling or shipping. The strength of the film depends on the Type of polymer and its content in the composition. The physicochemicalProperties of the polymer or polymers selected for film formulation play an Important role in determining the final disintegration of the prepared film. Plasticizers Formulationdecisions (plasticizers, etc.) are reported to be Important factors affecting the propertiesof film

Natural Polymer	Synthetic Polymer
Starch	Hydroxy propyl methylcellulose
Pectin	Poly vinyl pyrolidone
Gelatin	Polyvinyl alcohol
Sodium alginate	Sodium carboxy methylcellulose

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

Plasticizer

Plasticizer is an important component of melt film. Plasticizers help soften the Strip andreduce the brittleness of the film. It increases film performance by Lowering the glass transition temperature of the polymer.Plasticizers are generally used at 0–20%; w/w dryweight of polymer. However, Using the wrong plastic wrap will cause the film to crack, crack, and strips to Peel off. It is also reported that the use of plastic may affect the absorption of the drug

Sweetening agents

Sweeteners have become the important part of the formulation intended to be Disintegrated or dissolved in the oral cavity. Generally sweeteners are used in the concentration of 3 to 6 %w/w either alone or in combination. Both natural Sweeteners aswell as artificial sweeteners are used in the formulation of these fast dissolving films. Polyhydric alcohols such as sorbitol, mannitol, and isomalt can be used in combination as they additionally provide good mouth feel and cooling sensation

Flavoring Agents.

Flavoring agents can be selected from the synthetic flavor oils, oleo resins, Extract derivedfrom various parts of the plants like leaves, fruits and flowers. Flavors can be used alone or in the combination. Any flavor can be added such as essential oils or water soluble extracts of menthol, intense mints such as Peppermint, sweet mint, spearmint, wintergreen, cinnamon, clove, sour fruit.

Preferred Flavour:-

Antibiotics Cherry , maple ,pineapple, orange, raspberry, banana vanilla, Vanilla

Antihistamines Aprricot , cherry, cinnamon, grape, honey, lime, raspberry

Decongestants & Expectorants- Anise , apricot, butterscotch, cherry, strawberry,coriander

Saliva stimulating agent:-

Stimulants. Eg. Citric acid, malic acid, lactic Acid, ascorbic acid and tartaric acid. These agents are used alone or in Combination between 2 to 6%w/w of weight of the strip25

Surfactants

Surfactants are used as solublising or wetting or dispersing agent so that the Film is getting dissolved. Some of the commonly used are sodium lauryl sulfate, Benzalkoniumchloride, bezthonium chloride, tweens etc.

Coloring agents

FD & C approved coloring agents are used (not exceeding concentration levelsOf 1 percent; w/w) in formulation of oral thin film .

Manufacturing styles -

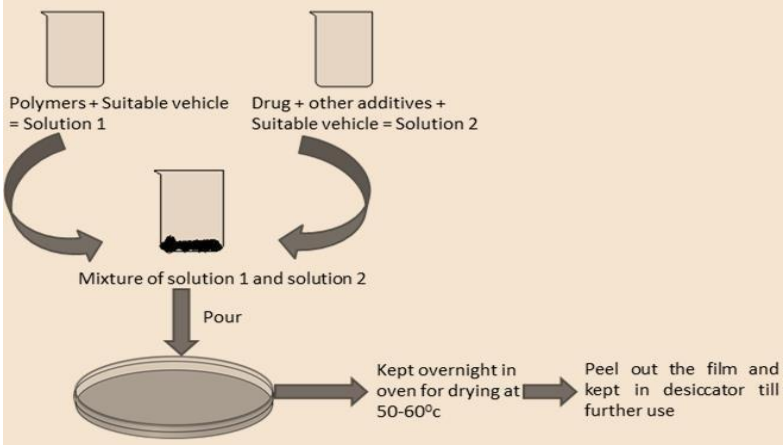
Differential surveying calorimetry(DSC)

To probe any possible relations between the medicine and the employed buccoadhesive accoutrements , Differential surveying Calorimetry(DSC) was achieved on lidocaine HCl, Chitosan, PVP, and physical fusions of lidocaine(1:1) with these Polymers using Perkin Elmer DSC8000. The samples, each importing between 5 and 7 mg were countedinto aluminum kissers and sealed. DSC runs were performed at a heating rate of 5 °C/ min over a temperature of 25 – 400 °C. Peak temperature, Glassy transition and heat ofemulsion were determined in every Sample using the software.

Solvent casting method:-

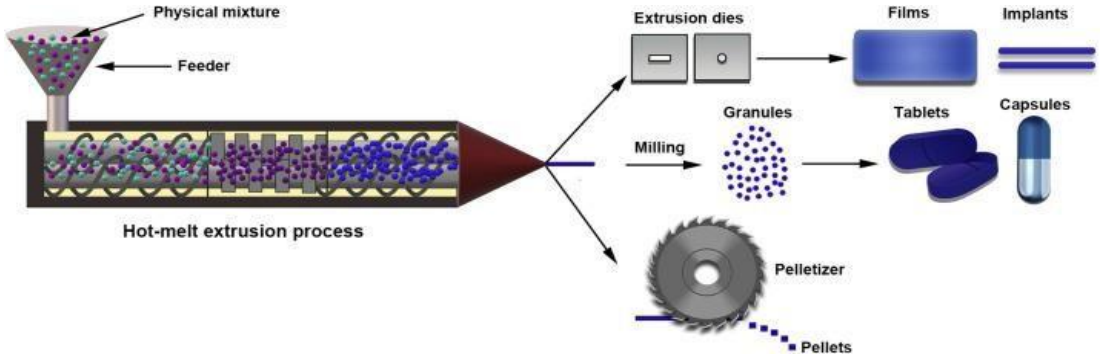
Fast dissolving buccal flicks are rather formulated using the solvent Casting system, whereby the water answerable constituents are dissolved to form a clear thick result and the medicine along with other excipients is dissolved in suitable constituents that are water answerable are dissolved inwater. Drug and other constituents are dissolved in suitable detergent to form a clear Viscous result. Both results are mixed. Degass under vaccum the performing result casted as a fil

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024



Hot melt extrusion:-Hot metal extrusion is commonly used to prepare granules, sustained release tablets, transdermal and transmucosal drug delivery systems. Melt extrusion was used as manufacturing tool in the pharmaceutical industry as early as 1971

Hot-melt extrusion equipment consists of an extruder, auxiliary equipment for the extruder, down stream processing equipment, and other monitoring tools used for performance and product quality evaluation



Evaluation

After preparing the oral thin films, conduct various tests to evaluate their quality and performance, as outlined in the previous response under the "Evaluation" section. These tests may include physical characteristics assessment, drug content uniformity, in vitro drug release, mechanical properties testing, stability studies, taste evaluation, and optional in vivo evaluation

It's essential to adhere to good manufacturing practices (GMP) and regulatory guidelines throughout the formulation, preparation, and evaluation of the oral thin film of lidocainehydrochloride to ensure the safety, efficacy, and quality of the final product. Additionally, consider consulting with a qualified pharmaceutical formulation scientist or pharmacist for further guidance and optimization of the formulation and method.

Physical Characteristics

Visual inspection for uniformity, color, and clarity of the film. Measurement of thickness using a micrometer. Determination of weight uniformity by cutting samples of the film and weighing them.

Drug Content Uniformity:

Analytical methods such as UV spectroscopy can be used to determine the amount of lidocaine hydrochloride in the film.

In Vitro Drug Release:

Perform dissolution studies using a suitable medium and apparatus (e.g., USP apparatus II) to evaluate the release of lidocaine hydrochloride from the film over time.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

Mechanical Properties:
Testing for tensile strength, elongation at break, and flexibility of the film using instruments like a texture analyzer.
Stability Studies:
Conduct stability testing under colourful conditions (e.g., temperature, moisture) to assess the shelf-life of the oral thin film.
In Vivo Evaluation (Optional):
Still, conduct studies in mortal levies to evaluate the bioavailability and pharmacokineticsof lidocaine hydrochloride from the oral thin film.
Taste Evaluation (Optional):
Organoleptic testing to assess the taste, mouthfeel, and overall adequcy of the oral thin film.
Tensile strength –
It is the outs stress applied to a point at which the strip instant breaks. It is calculatedby the applied cargo at rupture divided by the Cross-sectional area of the strip as given in the equation below:

$$\text{Tensile strength} = \frac{\text{Load at breakage}}{\text{Strip consistance} \times \text{Strip Width}}$$

Percent extension
When stress is applied, a strip sample stretches and this is to appertained as strain. Strainis principally the distortion of strip divided by original dimension of the Sample. Generally elongation of strip increases as the plasticizer content Increase

$$30\%\ \text{Extension} = \frac{\text{Increase in length} \times 100}{\text{Original length}}$$

Folding abidance
It is determined by repeated folding of the strip at the same Place till the strip breaks. The number of times the film is folded without Breaking is reckoned as the folding abidance value
Assay/ Content uniformity
This is determined by any standard assay system described for the particular API in anyof the standard pharmacopoeia. Content uniformity is determined by Estimating the APIcontent in individual strip. Limit of content uniformity is 85–115 percent.
corruption time-
Corruption of orally fast dissolving flicks requires USP corruption Apparatus. The corruption time limit of 30 seconds or lower for orally Disintegrating tablets described in CDER guidance can be applied to fast dissolving oral strips. Corruption time will vary depending on the expresssion but generally the corruption range from 5 to 30 seconds. Although, no sancitoned guidance is available for oral fast disintegrating flicks strip.
Dissolution test-
Dissolution testing can be performed using the standard handbasket or paddle outfit described in any of the pharmacopoeia. The dissolution medium will basically be namedas per the Gomorrah conditions and loftiest cure of the API. Numerous times the dissolution test can be delicate due to tendency of the strip to float onto the dissolution medium when the paddle outfit is employed.
PACKAGING OF FAST DISSOLVING ORAL FILM
There are a lot of packaging options available for oral thin films; still, the Packaging should be chosen pricesly to ensure the product's integrity. The condition for unit cure packaging, barcode labelling, the content of Instructions for operation, child-resistant sealing, and elderyl friendly packaging are all criteria that must be considered during packing
The packing paraphernalia chosen must have the following characteristics:
They must be nontoxic
They must be approved by the FDA
• They must not reply to the product.
• They must not conduct taste and odour to the product.
• They must fulfil any demanded temperature resistance conditions.Colourful type of packagings;

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

Sacks made of antipode, paper, or plastic.
Single sacks or aluminium sacks.
Multiple-unit fester card.Conclusion
The results of this study show that bilayered flicks may be prepared by colorful styles. Likewise, colorful film formers were delved and expression development was bandied. The use of different styles for characterizing bilayered flicks was estimated and it came egregious that some tests, similar as decomposition, dissolution, and mechanical strength,need to be optimized in terms of oromucosal filmformulations.The medicinal companiesprefer this lozenge form.
Due to both patient compliance(especially pediatric and senior) as well as Industrial adequacy. They combine the lesser stability of a solid lozenge Form and the good connection of a liquid. Oral flicks can name from request Due to lower cost and consumerpreference. This technology is a good tool for Product life cycle operation for adding thepatent life of being Products. OFDFs are also having great eventuality of delivering the medicinal Agent systemically as well locally and have several advantages over numerous Lozenge forms indeed over the fast disintegrating tablets. This explains the expansive exploration laboriously going on this technology

REFERENCES

[1]. Gandhi SD, Pandya PR, Umbarkar R, Tambawala T, Shah MA. Mucoadhesive drug delivery systems an unusual maneuver for site-specific drug Delivery system.. Pharm SciMonit an Int J Pharm Sci., 2011; 2(3): 132–52.
[2]. Theory and Practice of Contemporary Pharmaceutics. Ghosh TK, Jasti BR, Editors. CRC Press, 2005; 282–367: 150–155.22.
[3]. Bhyan B, Jangra S, Kaur M, Singh H. Orally fast dissolving films: Innovations in formulation and technology. Int. J. Pharm. Sci. Rev. Res., 2011; 9(2): 50–57.23.
[4]. Bala R, Pravin Pawar, Sushil Khanna, Sandeep Arora. Orally dissolving Strips: A newapproach to Oral drug delivery system. Int. J. Pharm. Invest, 2013; 3(2): 67–76.
[5]. Choudhary DR, Patel VA, Chhalotiya UK, Patel HV, Kundawala AJ. Development and characterization of pharmacokinetic parameters of fast-Dissolving films containing levocetirizine. Sci. Pharm, 2012; 80: 779–787.
[6]. Valleri M, Mura P, Maestrelli F, Cirri M, Baller in R. Development and Evaluation of glyburide fast dissolving tablets using solid dispersion technique. Drug Dev In Pharm, 2004.30(5): 525-34.
[7]. Nissen LM, Haywood A, Steadman KJ. Solid medication dosage form Modification at the bedside and in the pharmacy of Queensland Hospitals. J Pharm Prac Res,2009. 39:129–134
[8]. Nagendrakumar D, Keshavshetti GG, Mogale P, Swami S, Swami H, Formulation and evaluation of fast dissolving oral films of metoprolol succinate. Int J Eng App Sci,2015. 6:28–38
[9]. Smart JD. Buccal drug delivery.Expert Opin. Drug Delivery, 2005.2:507–517
[10]. Rathbone MJ, Drummond BK, Tucker IG. The oral site as a site for systemic Drug delivery. Advanced Drug Delivery Rev, 1994.13:1–22.
[11]. Godbole A, Josh R, and Sontakke M. Oral Thin Film Technology-Current Challenges and Future Scope. IJAAS,2018.7(2):1-14.
[12]. Sandy H, Michelle M, Chasai T, Katherine L, Andrew D, Franz B. Topical Lidocaine to improve oral intake in children with painful infectious mouth Ulcers-blinded, randomized, placebo-controlled trial. Annals Emerg Med, 2014.63: 292-299.
[13]. Ahmad J, Andrabi SIH, Rathore MA. Comparison of topical glyceryl Trinitrate with lignocaine ointment for treatment of anal fissure: A randomised Controlled trial. Int J Surg, 2007.5: 429-432.
[14]. Rana A, Shereen A, Mutaz S &Alsayed S. Mucoadhesive Dosage form of Lidocaine Hydrochloride: I. Mucoadhesive and Physicochemical Characterization. Drug Dev Ind Pharm. 2007. 33(8):855-64.
[15]. Chaudhary H, Gauri S, Rathee P, Kumar V. Development and optimization Of fast dissolving oro-dispersible films of granisetronHCl using Box-Behnken Statistical design. Bull Facul Pharm Cairo Uni, 2013.51: 193-201.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

[16]. Quinn RH, Wedmore I, Johnson E, Islas A, Anglim A, Zafren K, et al. Wilderness medical society practice guidelines for basic wound management in The austere environment. Wild Environ Med, 2014.25:295 –310.
[17]. Kim NW, Lee MS, Kim KR, Lee JE, Park JS, Matsumoto Y, et al. Polyplex-releasing microneedles for enhanced cutaneous delivery of DNA Vaccine. J Control Release, 2014.179:11–7.
[18]. Marina K, Narayana R, K Vijayanarayana & Prabhakara P. In vitro and in-Vivo. Evaluation of chitosan buccal films of ondansetron hydrochloride. Int J Pharm Investig. 2011. 1(3): 164–171.
[19]. Kruder GA. Extrusion. In: Encyclopedia of Polymer Science and Engineering Vol. 1, 2nd ed. John Wiley & Sons Inc., New York (1985) 571-631.