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Fast Dissolving Film: A Review

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Abstract

Oral routes are most commonly preferred route for delivering drug. Most common oral dosage forms are tablet and capsules. But many patients such as geriatric, pediatric and dysphasic patients find difficult to swallow conventional tablet and capsule. To overcome various problems related to swallowing, Fast Dissolving Tablets were designed in early 19th century and hence further advancement has led to development of Fast Dissolving Oral Films. These are solid dosage forms, which disintegrate or dissolve within 1 min when placed in the mouth without drinking water or mastication. These thin sized film stripes are designed in such a manner for ease administration of drug when it's placed on or under the tongue. There by the film enables the drug to deliver directly in to the blood stream either buccally or sublingually. Likewise, to improve the onset of action, lower the dosing and enhance the efficacy.

Keywords: Fast Dissolving Film, Film forming polymers, Methods of preparation, Disintegration, *In vitro* Dissolution, Applications of fast dissolving films.

Introduction

Fast dissolving films are the most advanced form of oral solid dosage form due to more flexibility and comfort. It improves the efficacy of Active Pharmaceutical Ingredients by dissolving within minute in oral cavity after the contact with saliva without chewing and no need of water for administration. It gives quick absorption and instant bioavailability of drugs due to high blood flow and permeability of oral mucosa is 4-1000 times greater than that of skin. **[Chaurasiya, Puja *et al.*, 2016]** Fast Dissolving Films are useful in patients such as pediatric, geriatrics, bedridden, emetic patients, diarrhea, sudden episode of allergic attacks, or coughing for those who have an active life style. **[Swami, Swati *et al.*, 2015]** It is also useful where local action is desired such as local anesthetic for toothaches, oral ulcers, cold sores or teething. **[Ravi Kumar K. *et al.*, 2014]** Fast dissolving films come in the form of a thin strip and can be produced by solvent casting method, hot melt extrusion and rolling method. The disintegration time of Fast Dissolving Film is usually short, due to their lower thickness, but the dose of the drug that can be incorporated into the film is strongly limited. **[Alhalbi, F.W. *et al.*, 2017]** Oral film includes various ingredients for its formulation which includes polymers, active pharmaceutical ingredient, film stabilizing agents, sweeteners, flavors, colors, saliva stimulating agents, preservatives, surfactants etc. but the first and far most a very essential ingredient which helps in film formation is a Polymer. A variety of polymers are available for preparation of Fast

Dissolving film. As the strip forming polymer is the most essential and major component of the Fast Dissolving Film at least 45%w/w of polymer should be present based on the total weight of dry film but typically 60 to 65%w/w of polymer is preferred to obtain desired properties. The polymers can be used alone or in combination to obtain the desired strip properties. The film obtained should be tough enough so that there won't be any damage while handling or during transportation. The robustness of the strip depends on the type of polymer and the amount in the formulation. **[Pathare, Y.S. *et al*., 2013]**

Special Features of Fast Dissolving Films

- Thin elegant film
- Unconstructive
- Available in various size and shapes
- Fast disintegration
- Rapid release
- Give a pleasant mouth feel
- Have an acceptable taste
- Should not leave residues in mouth **[Patel, Dipal *et al*., 2015]**

Ideal Properties of Fast Dissolving Films

- It should have an acceptable taste.
- It should give a pleasing mouth feel.
- It should be less friable and have good mechanical strength to withstand the post manufacturing handling.
- It should be stable in environmental conditions.
- Subsequent to oral administration, it should leave least or no residue in mouth.
- It should quickly dissolve to release drug instantaneously in mouth.
- It should be compatible with the other ingredients. **[Kaur, Mandeep *et al*., 2013]**

Advantages of Fast Dissolving Films

- No need of water for administration.
- Convenient for pediatric, geriatric and dysphasic patients having difficulty in swallowing.
- Rapid disintegrating and dissolution in the oral cavity due to larger surface area of films.
- Rapid onset of action with increased bioavailability due to bypassing hepatic first pass effect.
- Reduce dose, enhances the efficacy and safety profile of the drug with reduced side effects.
- Flexible and portable in nature so they provide ease in handling, transportation and storage.
- Ease of administration to mentally ill, disabled, un-cooperative patients and the patients who are on reduced liquid intake plans or are nauseated.
- Beneficial in cases such as motion sickness, acute pain, sudden allergic attack, asthmatic attack and coughing, where an ultra rapid onset of action is required.
- Stability for longer duration of time, since the drug remains in solid dosage form till it is consumed.

- Accuracy in dose as compared to liquid formulations.
- Pleasant mouth feel, leave negligible or no residue in the mouth after administration. **[Jain, Ashish *et al*., 2018]**

Disadvantages of Fast Dissolving Films

- Drugs which are unstable at buccal pH cannot be administered.
- Drugs which irritate the mucosa cannot be administered by this route.
- Drug with small dose requirement can only be administered.
- Most drugs have bitter taste, and need taste masking.
- Fast Dissolving Films are fragile and must be protected from water so it needs special packaging.
- Dose uniformity is a technical challenge. **[Reddy, S.K. *et al*., 2018]**

Classification of Fast Dissolving Films

There are three different subtypes

- Flash release
- Mucoadhesive melt-away wafer
- Mucoadhesive sustained-release wafers

These three types of oral films are differentiated from each other in following table.

Property/Sub Type	Flash release water	Mucoadhesive melt-away wafer	Mucoadhesive sustained release wafer
Area (cm^2)	2-8	2-7	2-4
Thickness (µm)	20-70	50-500	50-250
Structure	Film: single layer	Single or multilayer system	Multi layer system
Excipients	Soluble, highly hydrophilic polymers	Soluble, hydrophilic polymers	Low/Non soluble polymers
Drug phase	Solid solution	Solid solution or suspended drug particles	Suspension and /or solid solution
Application	Tongue(upper palate)	Gingival or buccal region	Gingival, (other region in the oral cavity
Dissolution	Maximum 60 seconds	Disintegration in a few minutes, forming gel	Maximum 8-10 hours
Site of action	Systemic or local	Systemic or local	Systemic or local

Formulation Components of Fast Dissolving Films

Formulation of Fast Dissolving Films involves the intricate application of aesthetic and performance characteristics such as taste masking, fast dissolution, physical appearance, mouths feel etc. From the regulatory perspectives, all excipients used in the formulation of fast dissolving films should be Generally Regarded as Safe (i.e. GRAS listed) and should be approved for use in oral pharmaceutical dosage forms.

- Active pharmaceutical ingredient
- Film forming polymers

- Plasticizers
- Saliva stimulating agents
- Sweetening agents
- Flavoring agents
- Coloring agents

Active Pharmaceutical Ingredient (5-30%)

The film composition contains 5-30% w/w of the active pharmaceutical ingredient. Always use low dose active pharmaceutical ingredients because high dose of drug are difficult to incorporate in fast dissolving film. A number of drugs can be used as fast dissolving oral film including anti-histamine, anti-diarrheal, anti-depressants, vasodilators, anti-asthmatic, antiemetic, etc. Dimenhydrinate can also be incorporated into Fast Dissolving Film for taste masking. Common examples of drugs incorporated into Fast Dissolving Films are salbutamol sulfate, rizatriptan benzoate, verapamil, ondansetron, dexamethasone, rofecoxib, cetirizine, pilocarpine, tianeptine sodium, indomethacin, etc. **[Sheoran, reena *et al*., 2018] [Mahboob, M.B.H. *et al*., 2016]**

The ideal characteristics of a drug to be selected

- The drug should have pleasant taste.
- The drug to be incorporated should have low dose.
- The drugs with smaller and moderate molecular weight are preferable.
- The drug should have good stability and solubility in water as well as in saliva.
- It should be partially unionized at the pH of oral cavity.
- It should have the ability to permeate oral mucosal tissue**. [Bhyan, Bhupinder *et al*., 2011]**

Film Forming Polymers (40-50%)

Fast dissolving Film is prepared using hydrophilic polymers that rapidly dissolves on the tongue or buccal cavity, delivering the drug to the systemic circulation via dissolution when contact with liquid is made. Water soluble polymers are used as film formers for fast dissolving films. The water-soluble polymers achieve rapid disintegration, good mouth feel and mechanical properties to the films. The disintegration rate of the polymers is decreased by increasing the molecular weight of polymer film bases. Some of the water soluble polymers used as film former are HPMC E3, E5 and E15 and K-3, Methyl cellulose A-3, A-6 and A-15, Pullulan, carboxmethylcellulose cekol 30, Polyvinylpyrollidone K-90, Pectin, Gelatin, Sodium Alginate, Hdroxypropylcellulose, Polyvinyl alcohol, Maltodextrins and Eudragit RD108, Eudragit RL100. Polymerized rosin is a novel film forming polymer. Various polymers can be employed to modulate the disintegration property of the fast dissolving film. This is especially used in case of slowly disintegrable oral bioadhesive strips or patches that need to be retained in intact form for longer duration in the oral cavity. The bioadhesive polymer used in such formulations imparts the adhesive property to the strip such that it adheres to buccal mucosa to deliver the drug for prolonged period. Bioadhesive polymer should ideally adhere quickly to the buccal mucosa and should have sufficient mechanical strength. **[Pathare, Y.S. *et al*., 2013]**

Ideal properties of the polymers used in the fast dissolving film

- Polymers should be non toxic and non- irritant.
- It should be non- bitter.
- Polymers should be tasteless.
- It should be devoid of leachable impurities.
- It should be inexpensive and readily available.
- It should not be an obstacle in the disintegration time.
- It should have good wetting and spreadability property.
- It should exhibit sufficient peel, shear and tensile strength.
- It should have sufficient shelf life.
- It should not cause secondary infection in the oral cavity. **[Saini, Parul *et al*., 2012]**

Plasticizers (0-20%)

Plasticizer can be used to improve the elasticity and de-crease the fragility of film by decreasing the glass transition temperature of polymer. The choice of plasticizer depends on its compatibility with polymer and the solvent type. Most commonly used plasticizers are glycerol, propylene glycol, polyethylene glycol, phthalate derivatives such as dimethyl, diethyl and dibutyl phthalate, citrate derivatives like tributyl, triethyl, acetyl citrate, triacetin and castor oil. 0-20% w/w plaster concentration is used by preventing cracking, splitting and peeling of strip. **[Mahboob, M.B.H. *et al*., 2016]**

Properties of plasticizers

- Plasticizer is a key ingredient for the quick dissolving films. It significantly enhances the film forming properties by diminishing the glass transition temperature of the polymer.
- Plasticizer serves to enhance the flexibility of the strip and reduces the brittleness of the films.
- The chemical structure and concentration of plasticizers play an important role in alleviating the glass transition temperature of the polymers.
- The selection of plasticizer depends on its compatibility with the polymer and also the type of solvent employed in the casting of the film.
- The flow of polymeric solution gets better with the use of plasticizer and improves the strength of the polymer.
- Typically the plasticizers are used in the concentration of 0–20 percent w/v of dry polymer weight. However, inappropriate use of plasticizer may prompt to film breaking, splitting and peeling of the strip.
- It is also reported that the use of certain plasticizers may also affect the absorption rate of the drug. **[Mishra, Ashwini *et al*., 2017]**

Saliva stimulating agents (2-6%)

The purpose of using saliva stimulating agents is to increase the rate of production of saliva that would aid in the faster disintegration of the rapid dissolving strip formulations. These agents are used alone or in combination between 2-6% w/w of the strip. Citric acid, malic acid, lactic acid, ascorbic acid and tartaric acid are the few examples of salivary stimulants. **[Prabhu, S.C. *et al*., 2014]**

Surfactants

Surfactants are used as wetting or solublising or dispersing agent so that the film is getting dissolved within seconds and release active agent immediately. Commonly employed are polaxamer 407, bezathonium chloride, sodium lauryl sulfate, tweens, benzalkonium chloride, etc. Out of these most predominantly used surfactant is polaxamer 407. **[Naga, S.J. *et al.*, 2013]**

Sweetening agents

Low molecular weight carbohydrates and specially sucrose are most commonly used sweeteners. Sucrose is very soluble in water and being colourless does not impart any undesirable colour to the final formulation. It is stable over the pH range 4-8. It masks the taste of both salty and bitter drugs. Polyhydric alcohols such as sorbitol and mannitol also exhibit sweetening capacity and suitable for diabetic patients. Mannitol is half as sweet as sucrose and sorbitol has 50-60% of sweetness of sucrose. Sorbitol and mannitol have negative heat of solution therefore impart cooling sensation in mouth. Artificial sweeteners also termed as intense sweeteners. They are several hundreds to thousands times more sweeter than sucrose. Therefore they are hardly required at a concentration more than 0.2%. Only six artificial sweeteners are permitted for oral use within the European Union, the most widely used is sodium or calcium salts of saccharin. Both the salts exhibit high water solubility and are chemically and physically stable over wide pH range. Less widely used artificial sweeteners are aspartame, acesulfame potassium, thaumatin, sodium cyclamate, neohesperidine. Main disadvantage associated with artificial sweeteners is metallic or bitter aftertaste. A quite new sweetening agent in U.S. market is stevia powder; it is obtained from the extract of the leaves of the plant Stevia rebaudianabertoni. It is natural, nontoxic and safe and 30 times as sweet as sweet as sucrose. It is heat stable. **[Udupa, N. *et al.*, 2015]**

Flavoring agents

Flavours are used to mask the bitter taste of selected drug. Amount of flavour depends upon its strength and nature. Any US-FDA approved flavour can be used such as sweet, sour or mint flavor .These agents can be selected from the synthetic flavor oils, oleo resins. Extract derived from various parts of the plants like leaves, fruit and flowers. The amount of flavour to be used depends upon the type of flavour used. The age factor have important role in the taste. The young generation like fruit flavours while geriatric population like mint, cinnamon, clove etc. **[Himani *et al.*, 2018]**

Colouring agents

When drug is present in the film in a suspension or insoluble particulate form, colouring agents have to be incorporated in the oral film. Pigments such as titanium dioxide or FD&C approved colouring agents are generally used (not exceeding concentration levels of 1%w/w). **[Udupa, N. *et al.*, 2015]**

Methods of Preparation of Fast Dissolving Films

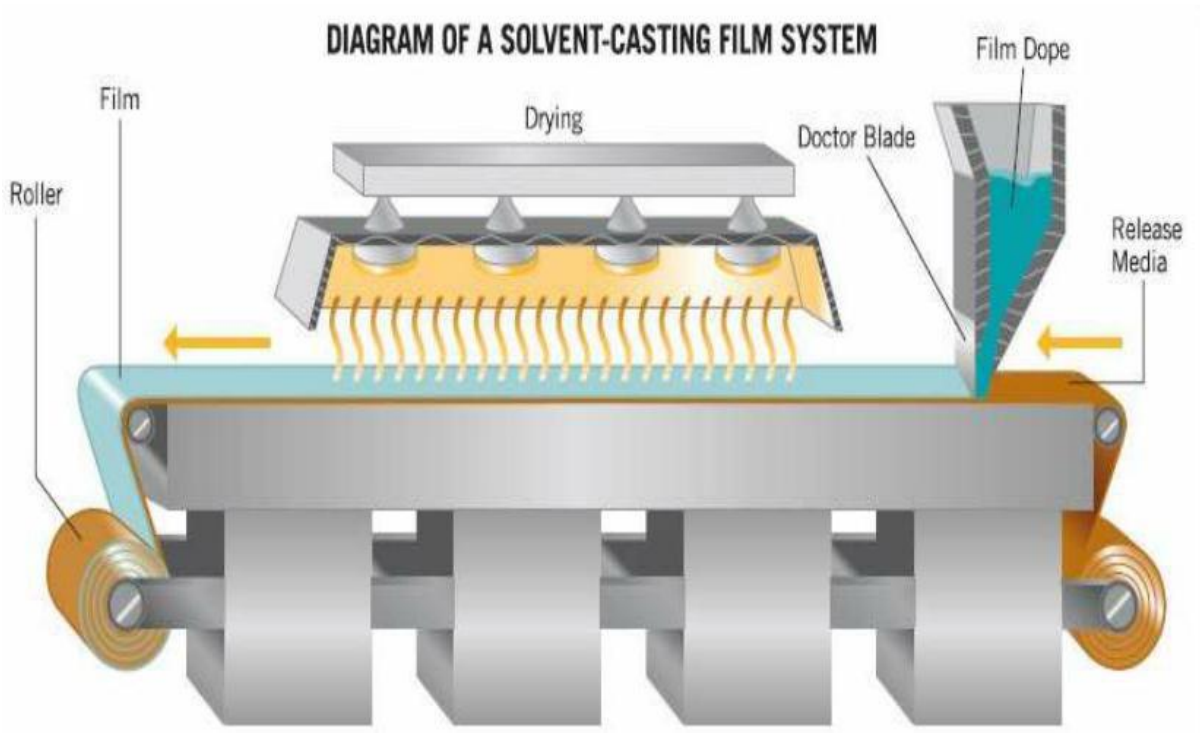
Generally following methods are used to preparation of fast dissolving films:

- Solvent casting
- Semi solid casting
- Hot melt extrusion
- Solid dispersion extrusion

- Rolling method

Solvent casting method

The Oral fast dissolving films are prepared by dissolving strip forming agents and plasticizer in the distilled water, then solution is continuously stirred up to 4 hours on magnetic stirrer and kept for 1 hour to remove all the air bubbles entrapped. Meanwhile, in the separate container remaining water soluble excipients i.e. sweetening agent, saliva-stimulating agent, flavor and drug are dissolved with constant stirring for 45 min. When the stirring is over both the solutions are mixed together with stirring for another 1 hour on magnetic stirrer. Then keep the solution stationary for 1 hour to let the foams settle down. The resulting formulation is casted on a suitable platform and is dried to form a film. The film is preferably air-dried or dried under oven then the film is carefully removed. Film is cutted in to desired shape and size. **[Reddy, S.K. *et al*., 2018]**



Advantages

- Great uniformity of thickness and great clarity then extrusion.
- A typical relative standard deviation (RSD) for uniformity testing of an oral thin-film batch prepared by liquid casting is on the order of 1.2% RSD.
- Films have fine gloss and freedom from defects such as die lines.
- Films have more flexibility and better physical properties. The preferred finished film thickness is typically 12-l00µm. **[Reddy. S.K. *et al*., 2018]**

Disadvantages

- The polymer must be soluble in a volatile solvent or water.
- A stable solution with a reasonable minimum solid content and viscosity should be formed.
- Formation of a homogeneous film and release from the casting support must be possible. **[Reddy, S.K. *et al*., 2018]**

Semisolid casting method

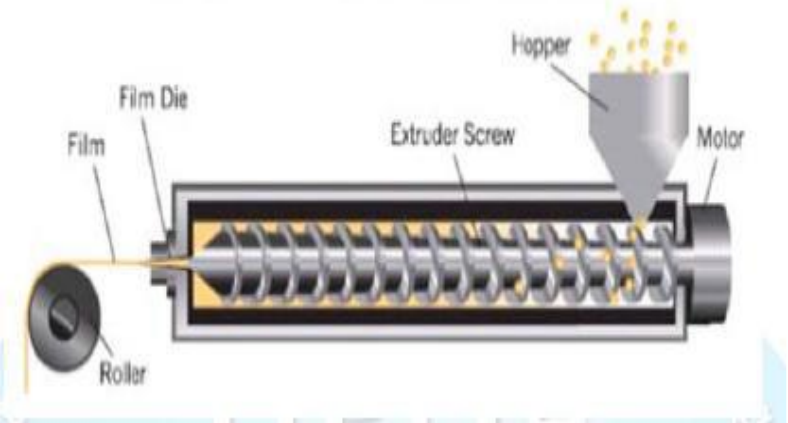
In semisolid casting method firstly a solution of water soluble film forming polymer is prepared. The resulting solution is added to a solution of acid insoluble polymer (e.g. cellulose acetate phthalate, cellulose acetate butyrate), which was prepared in ammonium or sodium hydroxide. Then appropriate amount of plasticizer is added so that a gel mass is obtained. Finally the gel mass is casted in to the films or ribbons using heat controlled drums. The thickness of the film is about 0.015-0.05 inches. The ratio of the acid insoluble polymer to film forming polymer should be 1:4. Both mixtures are mixed to form homogenous viscous solution. Degassed under vacuum Bubble free solution is coated on non-treated casting film coated film is sent to aeration drying oven Film is cutted in to desired shape and size. **[Saini, Sandeep *et al.*, 2011]**

Hot Melt Extrusion

In hot melt extrusion method firstly the drug is mixed with carriers in solid form. Then dried granular material is introduced into the extruder. The screw speed should set at 15 rpm in order to process the granules inside the barrel of the extruder for approximately 3– 4 min. The processing temperatures should be 8000C (zone 1), 11500C (zone 2), 10000C (zone 3) and 6500C (zone 4). The extrudate (T = 6500C) then pressed into a cylindrical calendar in order to obtain a film. **[Kumar, R.S. *et al.*, 2016]**

Advantages

- Without use of any solvent or water.
- Fewer processing steps.
- Compressibility properties of the Active Pharmaceutical Ingredient may not be of importance.
- Better alternative for poorly soluble drugs.
- More uniform dispersion because of intense mixing and agitation.
- Less energy compared with high shear methods.
- Possibility of scale up. **[U. Sahul Hameed Niyaz *et al.*, 2018]**



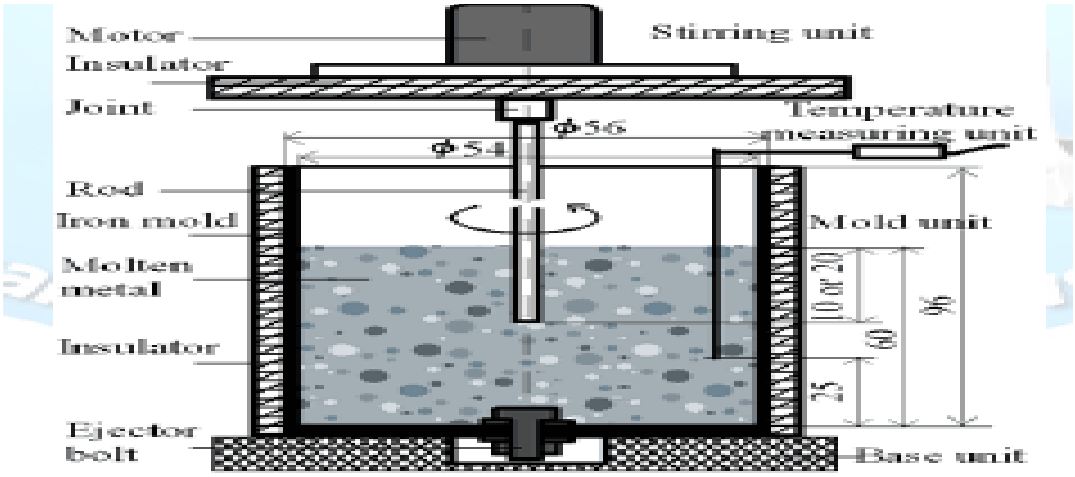
Apparatus for hot melt extrusion method of preparing fast dissolving film

Disadvantages

- Thermal degradation due to use of high temperature.
- Flow properties of the polymer are essential to processing.
- Limited number of available polymers.
- All excipients must be devoid of water or any other volatile solvent. **[U. Sahul Hameed Niyaz *et al.*, 2018]**

Solid dispersion extrusion

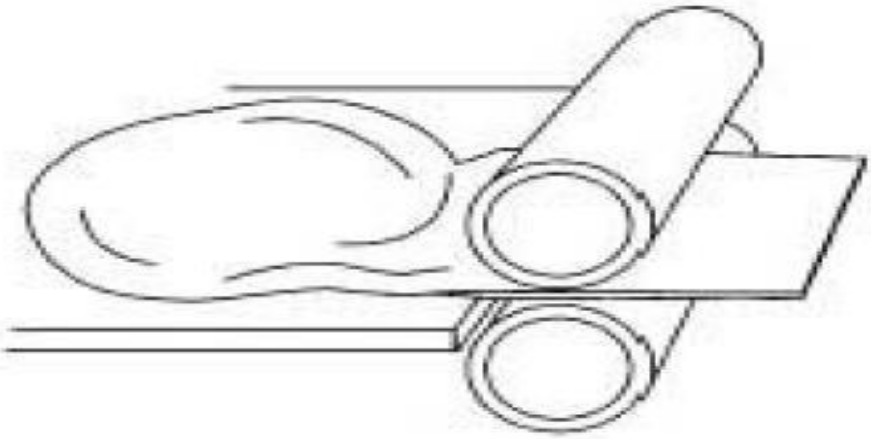
The term solid dispersions refer to the dispersion of one or more active ingredients in an inert carrier in a solid state in the presence of amorphous hydrophilic polymers. Drug is dissolved in a suitable liquid solvent. Then solution is incorporated into the melt of polyethylene glycol, obtainable below 70◦ C. Finally the solid dispersions are shaped into the films by means of dies. **[Pandya, Ketul *et al*., 2013]**



Solid dispersion extrusion method of preparing fast dissolving film

Rolling method

In these methods the film is prepared by preparation of a pre-mix, addition of an active and subsequent formation of a film. The pre-mix or master batch which includes the film forming polymer, polar solvent, and any other additives except a drug active is added to the master batch feed tank .Then a pre-determined amount of the master batch is controllably fed via a first metering pump and control valve to either or both of the first and second mixers. The required amount of the drug is added to the desired mixer through an opening in each of the mixers. After the drug has been blended with the master batch pre-mix for a sufficient time to provide a uniform matrix, a specific amount of the uniform matrix is then fed to the pan through the second metering pumps. The metering roller determines the thickness of the film and applies it to the application roller. The film is finally formed on the substrate and carried away via the support roller. The wet film is then dried using controlled bottom drying, desirably in the absence of external air currents or heat on the top (exposed) surface of the film. **[Malke, Sheetal *et al*., 2009]**



Apparatus used in Rolling Method of preparing fast dissolving film

Patented Technologies

XGel™

XGel™ is at the heart of Meldex international's intellectual properties used in all its film system and its ingestible delivery technologies. XGel™ film Technology developed by Bioprogress is bringing a revolution in the product offerings and manufacturing methods now available to the pharmaceutical industry. XGel™ film, potentially enhance the product stability. It has also been developed for non-ingestible applications such as cosmetic, ostomy pouches, sanitary and healthcare devices. The development and manufacture of XGel™ films uses a means called "solution casting". **[Gupta, A.K. *et al*., 2015]**

SOLULEAVES™

In this technology, the film is produced in order to release the active ingredients on coming in contact with saliva. This is applied to flavor-release products such as mouth fresheners, confectionery and vitamin products. SOLULEAVES™ technology can be used to deliver active ingredients to oral cavity efficiently and in a pleasant and easily portable form. The delivery system can be used for the cough/cold, gastrointestinal and pain therapeutic areas as well as nutritional products. SOLULEAVES™ films can also be designed to adhere to mucous membranes and to release the active ingredients slowly over 15 minutes. **[Kaur, Mandeep *et al*., 2013]**

WAFERTAB™

It is a drug delivery system that incorporates pharmaceutical actives into an ingestible filmstrip. The system provides rapid dissolution and release of actives when the strip comes into contact with saliva in the mouth. The WAFERTAB™ filmstrip can be flavored for additionally improved taste masking. The active ingredient is precisely dosed and integrated into the body of a pre-manufactured XGEL™ film, thus preventing exposure to unnecessary heat and moisture and potentially enhancing product stability. The WAFERTAB™ system lends itself to many possibilities for innovative product design, enabling. Multiple films with different actives to be bonded together. WAFERTAB™ can be prepared in a variety of shapes

and sizes and is an ideal method for delivery of medicines, which require fast release or for use by patients who have difficulty swallowing. **[S. Maheswari *et al*., 2017] FOAMBURST™**

FOAMBURST™ is a special variant of the Soluleaves™ technology where an inert gas is passed into the film during production. This results in a film with a honeycombed structure, which dissolves rapidly giving a novel mouth sensation. **[U. Sahul Hameed Niyaz *et al*., 2018]**

Micap

Micap signed an option agreement in 2004 to combine its expertise in micro encapsulation technology with the Bio Progress water-soluble films. [10] The developments aimed at providing new delivery mechanisms for the $1.4bn global market for smoking cessation products. **[Kaur, Mandeep *et al*., 2013]**

Evaluation Parameters

- Thickness
- Tensile strength
- Folding endurance
- pH measurement
- Assay/Content Uniformity
- Disintegration time
- *In-vitro* Dissolution study

Weight variation

Individual films were weighed and the average weights were calculated. Then the average weight of the films is subtracted from the individual weight of the films. A large variation in weight indicates the inefficiency of the method employed and also due to non uniform drug content in films. **[Himani *et al*., 2018]**

Thickness of the film

The thickness of the drug loaded films was measured with the help of micrometer screw gauge at different strategic locations like four corners and centre of the each film. Mean Standard Deviation is calculated. The standard range for film thickness should not be less than 5 %. This is essential to assure uniformity in the thickness of the film as this was directly related to the accuracy of dose. **[Shinkar, D.M. *et al*., 2017]**

Tensile strength

Tensile strength Tensile strength is the maximum stress applied to a point at which the film specimen breaks. It is calculated by the applied load at rupture divided by the cross-sectional area of the film as given below: **[Prabhu, S.C. *et al*., 2014] [Pavar, S.V. *et al*., 2015]**

$$\text{Tensile Strength} = \frac{\text{Force at break(N)}}{\text{Initial cross sectional area(mm}^2\text{)}}$$

Folding Endurance

The folding endurance is expressed as the number of folds (number of times the film is folded at the same place) required to break the specimen or to develop visible cracks. This also gives an indication of brittleness of the film. A strip of 2 cm × 2 cm (4 cm^2) was subjected to folding endurance by folding the

patch at the same place repeatedly several times until a visible crack was observed, and the values were reported. **[Sharma, J.K *et al*., 2018]**

pH measurement

The pH of the surface of the films was investigated to determine the probable side effects, since that incompatible alkaline or acidic pH may irritate the mucosa of the mouth. The pH meter was employed to measure the surface pH of the film by bringing the electrode in contact with a swollen yet intact film after exposure to 1 ml of distilled water for 1 minute at the room temperature; the pH was recorded after direct contact between the electrodes with the surface to equilibrate for 1 minute. **[Jaafar, I.S. *et al*., 2017]**

Assay/ Content uniformity

This is determined by any standard assay method described for the particular Active Pharmaceutical Ingredient in any of the standard pharmacopeias. Content uniformity is determined by estimating the Active Pharmaceutical Ingredient content in an individual strip. Limit of content uniformity is 85–115 percent. **[Sheoran, Reena *et al*., 2018]**

Disintegration time

Disintegration time is the time when film starts break when comes in contact with water or saliva. The disintegration time for fast dissolving film should be in range of 5-30sec. Time is determined by dipping the film in 25 ml water in a beaker by shaking gently. Time was noted when starts breaks considered as disintegrating time. **[Rathi, Varun *et al*., 2011]**

***In vitro* dissolution study**

Dissolution testing can be performed using the standard basket or paddle apparatus described in any of the pharmacopoeia. The dissolution medium will essentially be selected as per the sink conditions and highest dose of the API. Many times the dissolution test can be difficult due to tendency of the strip to float onto the dissolution medium when the paddle apparatus is employed. **[I.P. 2010]**

Packaging

A variety of packaging options are available for fast dissolving films. Single packaging is mandatory for films. Which are pharmaceutical products; an aluminium pouch is the most commonly used packaging format. Applied Pharma Research (Switzerland)-Labtec GmbH of Germany has developed the Rapid Card, a proprietary and patented packaging system which is specifically designed for the Mouth dissolving Films. The Rapid Card is exactly the same size as a credit card and holds three Mouth dissolving Films on each side. Every dose can be taken out individually, allowing the patient to carry six single, packaged doses of his medication in his purse or wallet and have it readily available. **[Ravi Kumar K *et al*., 2014]**

Applications of Fast Dissolving Films

Oral mucosal delivery via Buccal, sublingual, and mucosal route by use of FDFs could become a preferential delivery method for therapies in which rapid absorption is desired, including those used to manage pain, allergies, sleep difficulties, and central nervous system disorders. Dissolvable Fast Dissolving

Films evolved over the past few years from the confection and oral care markets in the form of breath strips and became a novel and widely accepted form by consumers for delivering vitamins and personal care products. **[Pandya, Ketul *et al*., 2013]**

Topical applications

The use of dissolvable films may be feasible in the delivery of active agents such as analgesics or antimicrobial ingredients for wound care and other applications. **[Saini, Sandeep *et al*., 2011]**

Gastro retentive dosage systems

Dissolvable films are being considered in dosage forms for which water-soluble and poorly soluble molecules of various molecular weights are contained in a film format. Dissolution of the films could be triggered by the pH or enzyme secretions of the gastrointestinal tract, and could potentially be used to treat gastrointestinal disorders. **[Pandya, Ketul *et al*., 2013]**

Diagnostic devices

Dissolvable films may be loaded with sensitive reagents to allow controlled release when exposed to a biological fluid or to create isolation barriers for separating multiple reagents to enable a timed reaction within a diagnostic device. **[Saini, Sandeep *et al*., 2011]**

Conclusion

Recently pharmaceutical companies embraced fast dissolving films as a practical and accepted alternative to traditional medicines. The unique properties of fast dissolving films such as easy administration, quickly disintegration, consumer preference, rapid action, etc making it as a useful delivery form of medication intended for geriatric, pediatrics or dysphasic patients who have difficult in swallowing tablets and capsule. This technology is also a good tool to pharmaceutical company for product life cycle management for increasing the patent life of existing products. The fast dissolving films bridges the gap between consumer preferences and manufacturer. Hence within the patient population and formulators fast dissolving oral films leads to be an ideal dosage form. This review is an effort to combine the knowledge available in fast dissolving oral films.

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