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Research Article

Formulation, Characterization and *In-Vitro* Evaluation of Fast Dissolving Oral Films of Cetirizine HCl

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ABSTRACT

The predominant goal of this work is to formulate and evaluate Cetirizine HCl ODF's the usage of Sodium starch glycolate (SSG) as superdisintegrant, Sodium alginate as polymer and Glycerol as plasticizer. Films were prepared by way of Solvent casting method and evaluated for thickness, folding endurance, percentage elongation, floor pH and disintegration time. The consequences indicate that method prepared with 17.5% combo of polymer and plasticizer was determined to be optimized. The three special formulations F1, F2 and F3 of CTZ motion pictures were organized via solvent casting technique the usage of sodium alginate as polymer, SSG as disintegrant and glycerol as plasticizer. Menthol was once used as cooling agent along with aspartame as sweetener and citric acid as a style overlaying agent. The formulation (F3) with presence of superdisintegrant and combo of polymer, plasticizer confirmed first-rate results.

Keywords: Cetirizine HCl, Oral thin film, superdisintegrant, polymer, plasticizer

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INTRODUCTION

Fast dissolving oral motion pictures (FDOFs) are the most advanced structure of oral solid dosage shape due to more flexibility and comfort. It improves the efficacy OF APIs with the aid of dissolving inside minute in oral cavity after the contact with saliva besides chewing and no want of water for administration¹. It gives speedy absorption and on the spot bioavailability of drugs due to excessive blood flow and permeability of oral mucosa is 4-1000 times larger than that of skin. The transport system is truly placed on a patient's tongue or any oromucosal tissue. Instantly moist with the aid of saliva due to presence of hydrophilic polymer and different excipients, the movie swiftly hydrates and dissolves to launch the medicine for oromucosal absorption. Mouth dissolving film is a skinny film with an place of 5-20cm containing an active ingredient. The on the spot dissolution, in water or saliva respectively, is reached through a extraordinary matrix from water-soluble polymers. Formulation issues (plasticizers etc)².The delivery system consists of a very thin oral strip, which is actually positioned on the patient's tongue or any oral mucosal tissue, immediately wet by means of saliva the film unexpectedly hydrates and adheres onto the website online

of application. It then hastily disintegrates and dissolves to release the medicinal drug for oromucosal absorption or with formula modifications, will maintain the quick-dissolving aspects permit for gastrointestinal absorption to be achieved when swallowed. The oral mucosa is composed of an outermost layer of stratified squamous epithelium. Below this lies a basement membrane, a lamina propria accompanied via the submucosa as the innermost layer. The epithelium is similar to stratified squamous epithelia located in the relaxation of the body in that it has a mitotically energetic basal mobile layer, advancing via a variety of differentiating intermediate layers to the superficial layers, the place cells are shed from the floor of the epithelium³. The oral mucosa in conventional is intermediate between that of the epidermis and intestinal mucosa in phrases of permeability. It is estimated that the permeability of the buccal mucosa is 4-4000 times increased than that of the skin. Several instructions of pills can be formulated as mouth dissolving motion pictures such as antiulcer (e.g. omeprazole), antiasthmatics (salbutamol sulphate), antitussives, expectorants, and antihistamines, NSAID'S (e.g. paracetamol, meloxicam, and valdecobix). Less bitter, robust and relatively lipophilic drug ought to be favored for OTF^{4,5}. Most superior research has proven that the concentration

stage of API per dose can prolong up to 50% per dose weight. Water-soluble polymers are used as movie formers. The use of movie forming polymers in dissolvable motion pictures has attracted considerable interest in medical and nutraceutical application. The water soluble polymers gain rapid disintegration, appropriate mouth experience and mechanical homes to the films^{6,7}. The disintegration price of the polymers is reduced by way of growing the molecular weight of polymer film bases. Some of the water soluble polymers used as film former are HPMC E-3 and K-3, Methyl cellulose A-3, A-6 and A-15, Pullulan, carboxymethylcellulose-cekol30, Polyvinylpyrrolidone PVP K-90, Pectin, Gelatin, Sodium Alginate, Hydroxypropylcellulose, Polyvinyl alcohol, Maltodextrins and EUDRAGIT-RD10⁸⁻¹⁰. By addition of

plasticizers, the mechanical residences of system (tensile electricity and elongation) can be improved. Mechanical property is plasticizers concentration established property. The in many instances used plasticizers are glycerol, dibutylphthalate and polyethylene glycols.

MATERIALS AND METHODS

Materials

Cetirizine hydrochloride was procured from Aurobindo Pharm., Hyderabad. Sodium alginate and Sodium starch glycolate were purchased from Nihal Traders, Hyderabad. Menthol, Glycerol, Aspartame, Citric acid were purchased from Span Pharma Pvt.Ltd, Hyderabad.

Table no: 1 Formula for Fast Dissolving Oral Film of CTZ

S.no	Ingredients	Formulation code(F1)	Formulation code(F2)	Formulation code(F3)
1	Cetirizine hydrochloride	90	90	90
2	Sodium alginate	100	324	556
3	Glycerol	150	100	134
4	Menthol	-	-	10
5	Aspartame	-	-	50
6	Sodium starch glycolate	140	80	100
7	Citric acid	-	60	60

Preparation of Fast Dissolving Oral Film of CTZ

Oral thin films had been prepared with the aid of solvent casting method. Sodium alginate used to be combined with distilled water with non-stop stirring¹¹. Drug was once delivered to this solution alongside with the cooling agent. Plasticizer used to be added to this mixture. Sweetener and taste overlaying agent is then delivered and stirred. Solution was once allowed to stand for 30 minutes. The solution was once then casted on a petri dish. Drying used to be performed for few hours at forty degrees. The motion pictures had been carefully peeled off and saved in air tight plastic containers.

Characterization of Films

1. Thickness Film

The thickness of movie can be measured by means of micrometer screw gauge at exclusive strategic areas (at least 5 locations)¹². This is vital to determine uniformity in the thickness of the film as this is without delay related to the accuracy of dose in the film.

2. Folding endurance

Folding persistence is decided via repeated folding of the movie at the same vicinity till the film breaks. The variety of instances the film is folded without breaking is computed¹³.

3. Surface pH

Film was left to swell for 2 hrs on the surface of an agar plate. Agar plate was organized by means of dissolving 2 % (w/v) agar in warm isotonic phosphate buffer (pH 6.8) with stirring and then pouring the solution in petridish and allowing it to gel at room temperature¹⁴. The floor pH was measured via ability of a pH paper placed on the floor of the swollen film.

4. Weight variation

This take a look at ensures the uniformity of the formed film. Three small portions have been reduce randomly, each of 1 cm 2 (1 × 1 cm) areas, and have been weighed individually.

5. Tensile strength

Tensile trying out used to be performed the use of a texture analyzer AG/MC1 (Acquati, Italy), geared up with a 5 N load cell. The movie was reduce into 30 × 20 mm strips. Tensile tests have been performed according to ASTM International Test Method for Thin Plastic Sheet (D882-02). Each check strip was positioned in tensile grips on the texture analyzer. Initial grip separation was 20 mm and crosshead pace used to be 1 inch/min¹⁵. The take a look at was once regarded concluded when the movie breaks. Tensile strength, used to be computed with assist of load require to destroy the movie and pass sectional region to evaluate tensile homes of the films. Tensile energy (TS) Tensile power is the most stress utilized to a point at which the movie specimen breaks and can be calculated by dividing the maximum load via the unique cross-sectional vicinity of the specimen and it was once expressed in pressure per unit region (MPa). Tensile Strength = Force at damage (N)/ Cross sectional place (mm²).

6. Mouth dissolving time

The mouth dissolving time was decided by way of putting the movie manually into a beaker containing 50 ml of 7.4 pH phosphate buffer. Time required by way of the film to dissolve used to be noted.

7. in- vitro Disintegration time

A small amount of disintegration medium is used. One drop of water was dropped from a 10-ml pipette onto the tightly clamped film. The time taken for the water to make a hole via the film was once measured as disintegration time(DT).

8. In vitro Dissolution test

Using Phosphate buffer (ph=6.8) as dissolution medium (900ml) in paddle type dissolution apparatus in-vitro dissolution of movie is carried out. Temperature is 37 and pace of 60rpm. Film is fixed on a glass slide with assist of adhesive so that drug ought to be released only from top

surface. Amount withdrawn is replaced. Drug released is calculated.

9. Stability studies

The optimized batch F3 was once packed in a butter paper covered with aluminum foil and used to be isothermally harassed to find out about the balance under accelerated temperature and relative humidity prerequisites carried out at 40°C/75% RH, 25°C/60% RH and 25°C/40% RH for a period of three months. Test samples were withdrawn every month and have been subjected to more than a few checks which include visible inspection of the film, disintegration time and cumulative % of drug released.

RESULTS AND DISCUSSION

The physical characterization of the formulated oral videos were completed by using a range of methods cited and the outcomes have been tabulated in Table-2 for a variety of parameters like weight version of the films, thickness of the films, Tensile electricity of the films, Folding persistence of the films, Disintegration time, Mouth dissolving time, Drug content and invitro dissolution.

Weight variation varies from 42.03±0.13 to 52.05±0.42 mg, as the polymer awareness increases the thickness, folding persistence and disintegration time of the movie additionally increases. The formulation F3 shows 33 Sec (disintegration time).



Figure 1. Fast dissolving oral films of CTZ

Table no: 2 Results of Fast Dissolving Oral Film of CTZ

Formulation code	Thickness Film	Folding endurance	Surface pH	Weight variation
F1	0.22 ±0.08	125 ± 2.15	6.67	52.05±0.42
F2	0.14±0.05	95 ± 1.10	6.69	46.07±0.26
F3	0.10±0.02	90 ± 0.95	6.65	42.03±0.13

Table no: 3 Results of Fast Dissolving Oral Film of CTZ

Formulation code	Tensile strength(Mpa)	Disintegration Time(sec)	Mouth dissolving time(sec)	Drug content (%)
F1	3.51 ± 0.04	45.12 ± 1.09	47.85 ± 2.5	99.4 %
F2	2.24 ± 0.08	39.75 ± 1.50	43.54 ± 1.8	98.2 %
F3	1.30 ± 0.03	33.20 ± 1.23	40.35 ± 1.5	97.0 %

The formulation F1 suggests the maximum fee of tensile power 3.51 ± 0.04 and folding persistence used to be a hundred twenty five This may be due to the formation of sturdy hydrogen bonds between polymer and plasticizer there by means of imparting flexibility to face up to rupture.

The In-vitro drug launch from the method f5 used to be 98.5% within 7 mins of time and values are given in table-3. The outcomes of the balance studies are given in the table-4. Formulation F3 showed cumulative percentage drug release of 99.18% within 15 min.

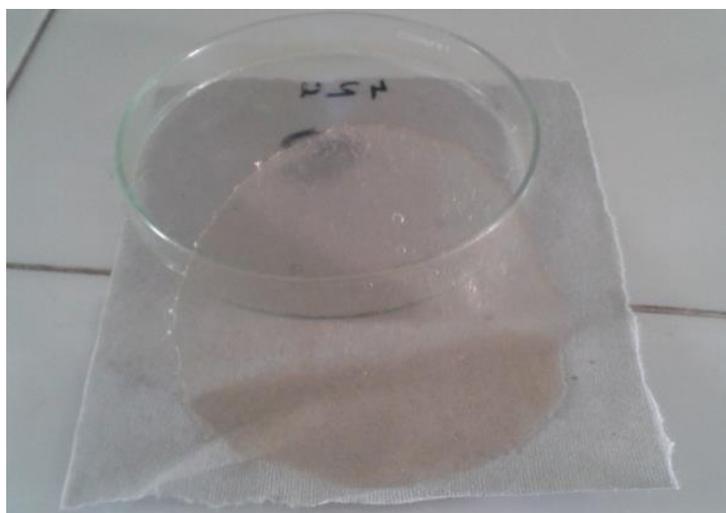


Figure 2. Fast dissolving oral films of CTZ

Table 4. Stability Studies

S.no	Time(Days)	Appearance	In-vitro Disintegration time	%CDR
1	Initial	(0 Days) Transparent and Acceptable	33.48 ± 3.05	98.8%
2	1 month	(30 Days) Transparent and Acceptable	32.15 ± 2.02	98.2%
3	3 months	(90 Days) Transparent and Acceptable	30.25 ± 2.04	97.1%

CONCLUSION

The three distinct formulations F1, F2 and F3 of CTZ films had been organized by way of solvent casting approach the use of sodium alginate as polymer, SSG as disintegrant and glycerol as plasticizer. Menthol was used as cooling agent along with aspartame as sweetener and citric acid as a style covering agent. All the videos were evaluated for a number of physical properties such as thickness, weight variation, folding endurance, surface pH, in-vitro release and disintegration time. The bodily parameters had been uniform for all formulations. The components (F3) with presence of superdisintegrant and blend of polymer plasticizer up to complete of 17.5% showed pleasant results.

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CONFLICTS OF INTEREST

No Conflict of Interest

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