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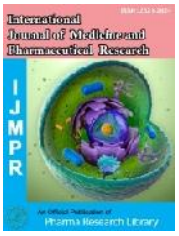

Research Article Open Access

Formulation and Comparative Evaluation of Pioglitazone Fast Disintegrating Tablets Prepared by Dry and Wet Granulation Techniques

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A B S T R A C T

Fast dissolving tablets constitute an innovative dosage form, which overcomes the problem of swallowing and provides a quick onset of action. The paediatric and geriatric populations are the primary. Targets, as both the groups found it difficult to swallow conventional tablets. The basic approach followed by all the currently available technologies engaged in the formulation of Fast dissolving tablets is to maximize the porous structure of the tablet matrix and incorporate super disintegrating agents in optimum concentration so as to achieve rapid disintegration and instantaneous dissolution of the tablet along with good taste masking properties and excellent mechanical strength. An Attempt was made to improve the disintegration capacity and Dissolution efficiency of the prepared formulations with the use of mixture of super disintegrants. Pioglitazone prepared alone with super disintegrants has shown the less release profile when compared to the release profile shown by the formulations with mixture of super disintegrants. The comparative evaluation of tablets prepared by direct compression and wet granulation showed varied results which proved direct compression method supported the drug to release more quickly and efficiently compared to the tablets prepared by wet granulation although the pre-compression properties of wet method is quietly suitable for the efficient manufacturing.

Keywords: Pioglitazone, Direct Compression, Wet Granulation, Disintegration

A R T I C L E I N F O

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1. Introduction

Oral route is the most preferred route for administration of various drugs because it is regarded as safest, most convenient and economical route. Oral route having the highest patient compliance is regarded as the most convenient, safest and also the most economical method of drug delivery. Solid dosage forms like tablets, capsules are the most popular form among all other dosage forms existing today because of its convenience of compactness, easy manufacturing and self administration[1].

Topical route is recently developed and is employed for only few drugs like nitroglycerine, scopolamine for systemic effect. Topical route has limitations in its ability to allow effective drug absorption for systemic drug action. Nevertheless it is possible that atleast 90 % of all drugs used to produce systemic effect are administered by oral route[2]. To overcome these problems in oral drug dosage form recently researcher developed the fast disintegrating tablets with improved patient compliance and convenience. Fast disintegrating tablets are solid dosage forms which dissolve rapidly in saliva without chewing and additional water. Fast disintegrating dosage forms are the drug delivery systems that disintegrate in the patient's oral cavity within less than a minute without the intake of water. Thus, these tablets are easily swallowed and have high patient compliance. Pioglitazone is used for the treatment of diabetes mellitus type 2. Maximum recommended dose is 30 mg daily, taken as two separate 15 mg doses, one tablet in the morning and one in the evening. Pioglitazone can be taken before or after food. Its half life varies form 3-7 hours and having the pKa value of 12.06 shows that the drug is suitable candidate to formulate as fast disintegrating tablets[3].

2. Materials and Methods

Materials:

Pioglitazone hydrochloride was received as a gift sample from Shreya Life Science, Aurangabad. Croscarmellose Sodium, Crospovidone & Indion 414 were received as a gift sample from Hetero Pharma, Hyderabad. Pharmatose were received as a gift sample from Friesland food demo Ltd Mumbai. All other ingredients used were of research grade.

Methods:

Preformulation Studies [4]

Compatability studies: Interaction studies were conducted in between the Pioglitazone and Superdisintegrants by I.R Spectral Studies.

Fourier Transform Infra Red Spectroscopy:

The Physico–Chemical Compatability between the Pioglitazone and the Super disintegrants was carried out by using Perkin Elmer Fourier Transform Infra Red spectrophotometer, Shelton USA. The sample scanned seperately under diffuse reflectance mold and plot of graph is given by taking the average of 100 scans. Before analysis the samples was completely dessicator dried.

Swelling study of super disintegrants:

The super disintegrants are studied for their swelling characters. For this study, a procedure given in the Indian Pharmacopoeia was used with little modification. 1g of the super disintegrant was transferred to a 100 ml measuring cylinder and water is taken up to 90 ml and shaken for 3 occasions during the period for 30 sec and allowed to stand for 15min avoiding entrapment of air. The volume was adjusted to 100ml with sufficient amount of water. The reading of the volume of the super disintegrants was noted. The swelling study was reported in the form of % swelling.

$$\text{Swelling studies (\%)} = \frac{\text{Final volume} - \text{Initial volume}}{\text{Initial Volume}} \times 100$$

Determination of Precompresion Characteristics

The following Preformulation studies were performed for pioglitazone formulations: -

Angle of Repose:

A funnel was fixed at a particular height on a burette stand. A graph paper was placed below the funnel on the table. The powdered drug passed through the funnel until it forms a pile. The radius of the pile was noted down. Angle of repose of the powder material was calculated using the formula. Results are shown in Table 5.

$$\text{Angle of repose } \theta = \tan^{-1} H/r$$

Where, H is height of the pile and r is radius of the pile.

Determination of Densities[5]:

Apparent Bulk Density:

The bulk density, as a measure used to describe packing materials or granules, was determined by transferring the accurately weighed amount of powder sample to the graduated cylinder with the aid of a funnel. The initial volume was noted. Ratio of weight of the sample to the volume it occupied was calculated.

Tapped Density:

Weighed powder sample was transferred to a graduated cylinder and was placed on the tapped density test apparatus, was operated for a fixed number of taps (100). The tapped density was determined as the ratio of weight of sample to tapped volume.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Carr's Index (% Compressibility):

Based on the apparent bulk density and the tapped density, the percentage compressibility of the bulk drug was determined by using the following formula.

$$\text{\% compressibility} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}}$$

Hausner's Ratio:

The ratio of tapped density to the bulk density of the powders is called the Hausner's ratio. Results are shown in Table 5.

Dispersibility [6]:

Weigh approximately about 1g of sample the material was droped from a total height (610mm) on to a tarred watch glass(dia-120mm) through a hallow cylinder placed vertically 102mm above the watch glass. The cylinder was secured to a support-stand by using support rings above and below the cylinder. The drop point is approximately 178mm vertically above the top of cylinder. The material

lanned within the watch glass is weighed. Any loss of powder during the fall was the result of dispersion. The percent dispersibility was caluculated using the formula

$$\text{Dispersibility}(\%) = \frac{weightofpowerinwatchglass}{initialweightofsample} \times 100$$

Porosity (€): Porosity of the compound is determined by liquid dispersion method [7]

$$(€) = \frac{bulkvolume - true\ volume}{bulk\ volume}$$

Formulation of Tablets [8]:

Direct Compression Method

The Tablets were prepared employing direct compression method. It is the process by which tablets are compressed directly from mixtures of the drug, super disintegrating agents and excipients without preliminary treatment such as granulation. All the formulations from F1 to F12 are prepared by direct Compression Technique reported in Table-1 & Table-2. The tablets were prepared by compression method using 7 mm biconcave punches on a 'EDISON mini press' a single station rotary compression mission.

Preparation of tablets by wet granulation method[9]:

Tablets containing 15 mg of PGTZN were prepared by wet granulation method and the various formulae used in the study are shown in the table 3. The drug, diluent, are passed through sieve no 12. All the above ingredients were properly mixed together (in a poly-bag). Talc and magnesium oxide were passed through mesh number 80, mixed, and blended with initial mixture in a poly-bag followed by compression of the blend. The tablets were prepared by compression method using 7 mm bi concave punches on a 'EDISON mini press' a single station rotary compression mission

Evaluation Studies [10]

Hardness:

Pfizer hardness tester was used for the determination of the hardness of tablets. Tablet was placed in contact between the plungers, and the handle was pressed, the force of the fracture was recorded. Results are shown in Table 2.

Friability:

Two tablets were accurately weighed and placed in the friabilator (Electrolab. EF-2 Friabilator) and operated for 100 revolutions. The tablets were de-dusted and reweighed. The tablets that loose less than 1% weight were considered to be compliant.

Weight Variation:

10 tablets were selected randomly from the lot and weighed individually to check for weight variation.

Thickness and Diameter:

The thickness and diameter of 4 tablets were recorded during the process of compression using Vernier calipers.

Uniformity of dispersion:

2 tablets were placed in 100 ml water and stirred gently until completely dispersed. A smooth dispersion was obtained which passed through a sieve screen 710 mcm (sieve number 22).

Wetting time:

A piece of tissue paper folded twice was placed in a small petridish (internal diameter = 6.5cm) containing 5 ml of distilled water. A tablet was placed on the paper, and the time for complete wetting of the tablet was measured in seconds

Disintegration test:

Tablets were taken and introduced one tablet in each tube of disintegration apparatus, and the tablet rack of the disintegration apparatus was positioned into a 1-liter beaker and the time of disintegration was recorded. To discriminate between the formulations disintegration was done at room temperature and disk was not used for the study.

Drug Content: Analytical methods for the estimation of pioglitazone:

Preparation of calibration curve:

100 mg of drug was accurately weighed and dissolved in 100ml of water and suitable dilution were made to get 2,4,6,8,10 µg/ml of the solution. Absorbance of various concentrations was measured by U.V spectrophotometer at 269nm using buffer solution as blank. 10 tablets were weighed and powdered, powder equivalent to1 tablet (150mg) of Pioglitazone was weighed and dissolved in pH 6.8 buffer and filtered the solution through the wattman filter paper. The filtrate was collected and diluted to a sufficient amount with pH 6.8 buffer till the conc. of the drug lies within the standard plot range. The diluted solution was analyzed for UV-spectrophotometer (UV-ELICO SL 120).

Dissolution studies:

The in vitro dissolution study was carried out in the USP dissolution test apparatus (EDISON-[ESI-06] Dissolution tester USP) type 2 (paddle). 900 ml of the dissolution medium 0.2m, phosphate buffer (PH 6.8) was taken in covered vessel and the temperature was maintained at 37 ± 0.5° C. The speed of the paddle was set at 75 rpm. Sampling was done every one min interval. For each sample 5 ml of the dissolution medium was withdrawn and the same amount of dissolution medium at 37°C was replenished to the dissolution medium. The % absorbance was determined.

3. Results and Discussion

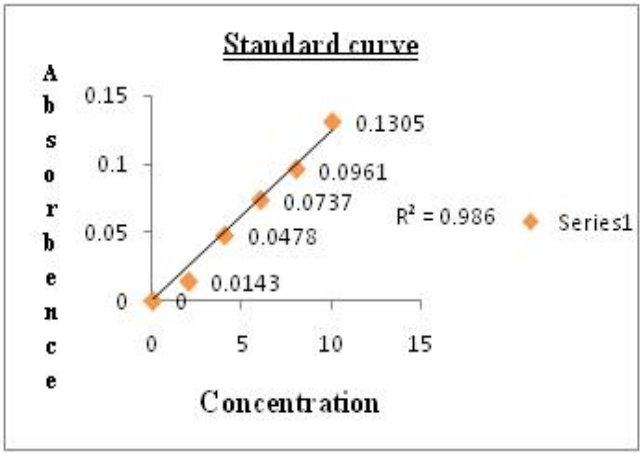

Figure 1: Construction of Calibration Curve

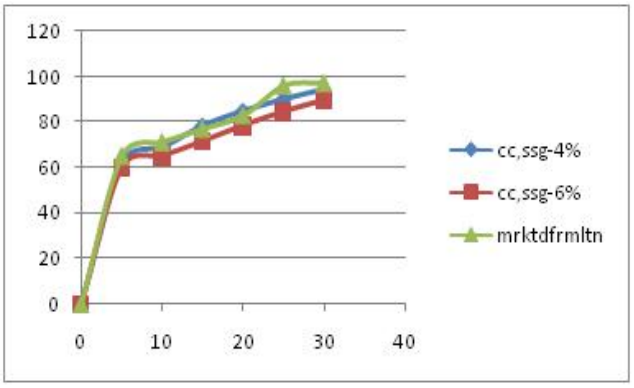

Figure 2: Dissolution Data Comparison of CC - Cp 4%, 6% with Marketed Formulation

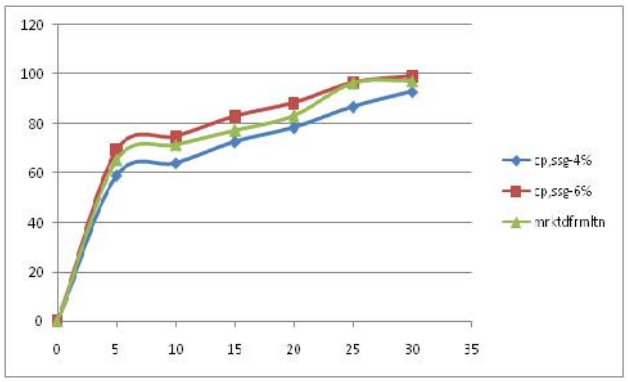

Figure 3: Dissolution Comparison of CC- SSG, 4%, 6% with Marketed Formulation

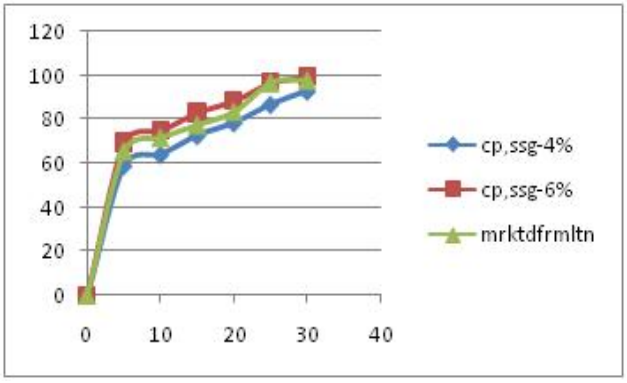

Figure 4: Dissolution Comparison of SSG -Cp4%, 6% with Marketed Formulation

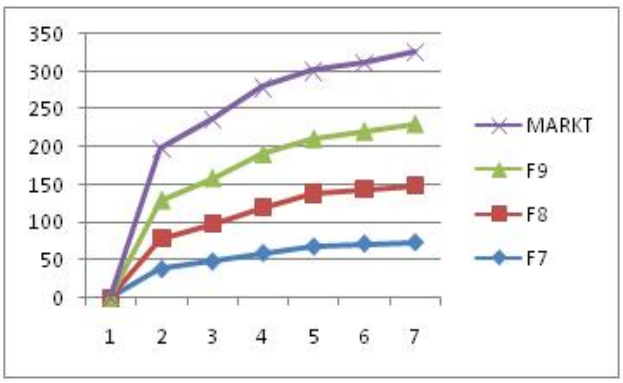

Figure 5: Dissolution comparision of F7, F8, F9 with Marketed formula

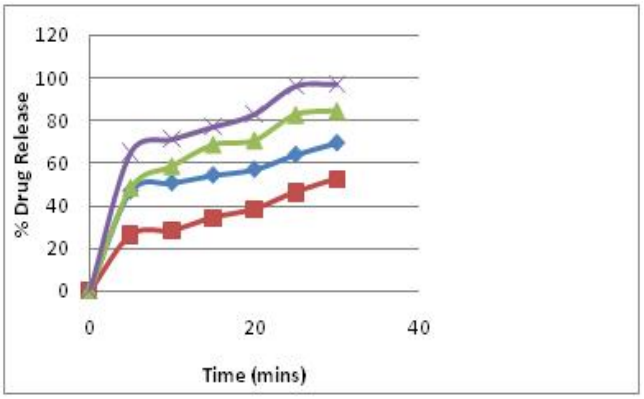

Figure 6: Dissolution comparison of F7, F8, F9 with Marketed formula

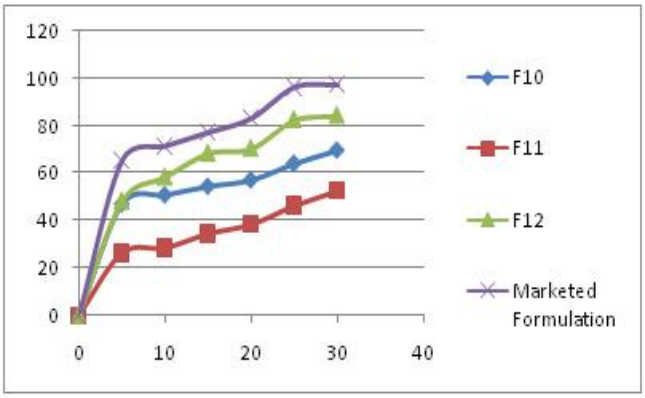

Figure 7: Dissolution Comparison of F10, F11, F12 with Marketed Formulation

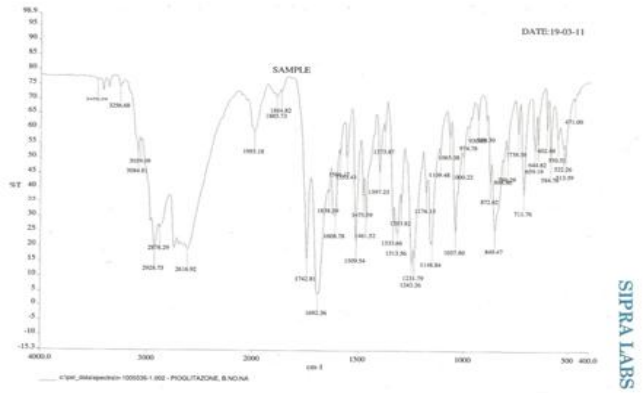

Figure 8: FT – IR Studies of Pioglitazone

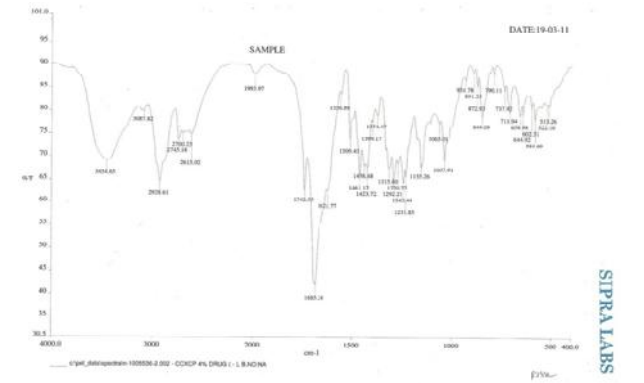

Figure 9: FT – IR Studies of CC × CP 4% & Drug

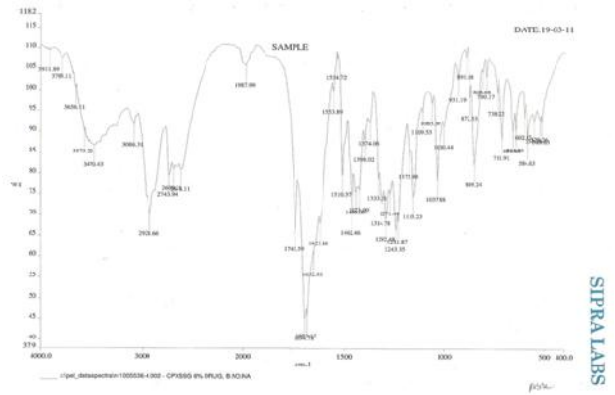

Figure 10: FT – IR Studies of CC × SSG & Drug

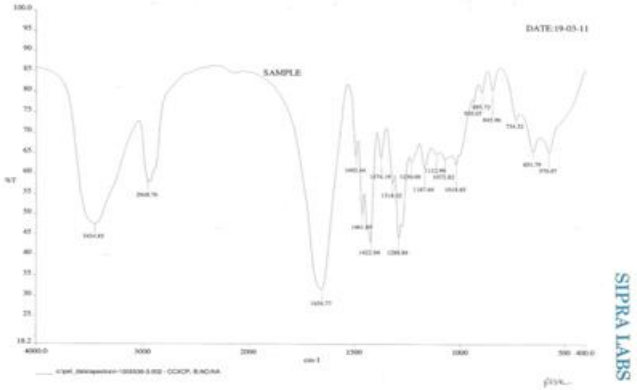

Figure 11: FT – IR Studies of CC × CP

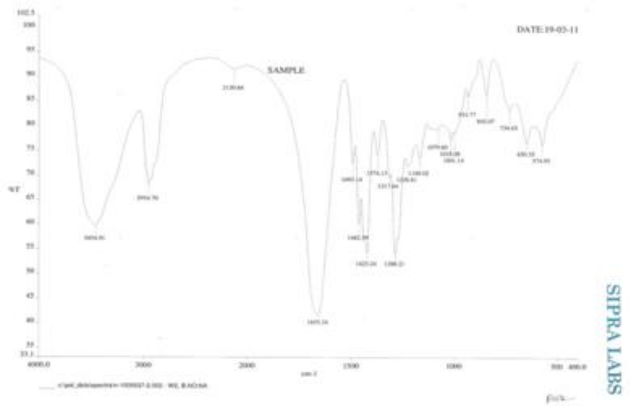

Figure 12: FT – IR Studies of CP× SSG

Discussions

To study the interactions existing in between pioglitazone and the super disintegrants mixture were subjected to IR studies and the results was showed in Fig.8 to Fig.12 Table 4,5 and 6 shows the pre compression properties of powders and granules of which the angle of repose values of granules was less and it shows the better repose values compared to powders. All the formulations with the mixtures of Super Disintegrants in different ratios added in different methods shown the comfortable values no such longer deviations among the formulations. Angle of repose (lowest value 22.53 highest value 39.69) for powders and where as the value is comparatively less for granules (lower 22.53, higher (30.54) which proved the granules have better flow properties. Fast disintegrating tablets are prepared in a single-station rotary compression machine. Table 7 8 and 9 shows the post-compressional parameters, hardness (3.1-5.0 Kg/cm), friability (≤ 0.75 %), weight variation (Passes) values of the tablets. It indicates that with the change in method of tablet preparation and use of super disintegrants uniformity of dispersion test. The values also show that the usage of super disintegrants in combination showed faster disintegration in tablets rather than the tablets prepared without combination. But tablets prepared by direct compression method, showed satisfied results compared to wet method in combination of super disintegrants.

Disintegration time:

The most important parameter that is needed to be optimized during the development of fast disintegrating tablets is disintegrating time of the tablets. The disintegration test of the tablets was conducted in purified water. Disintegrating study showed that the disintegrating times (Table 7,8,9) of the tablets (from 31 to 72 sec) with various concentrations and mixture of super disintegrants (1:1). However, disintegration time of the tablets prepared with mixture of super disintegrants (1:1) are in the acceptable range with no much deviations due to combitional effect of super disintegrant mixture. The results are in consistent with other results. The mixture of disintegrants (6%) by prepared by direct compression method showed satisfactory results.

Wetting time:

Table 7,8 and 9 shows the wetting time data. The wetting times of tablets containing the mixture of super disintegrants (1:1) with various concentrations are in the acceptable range. Usually the crospovidone having the low swelling rate has also showed the fast wetting effect due to the combitional effect of super disintegrants. This is due to the Synergistic effect of the super disintegrants taken as mixture in the ratio of 1:1.Increase in concentration of crosspovidone along with the other super disintegrants will modify the wetting property of crosspovidone and formulations prepared with the mixture of it. However, no significant change in the wetting time is seen with increase in the concentration of super disintegrant mixture (1:1). The wetting time of the tablets prepared by wet granulation showed more time to get wet due to the solvation action, which proved anhydrates will have faster tendency for drug absorption.

In-vitro release studies:

The dissolution of Pioglitazone from the tablets is shown in figure 2,3,4,5 (Table 11 and 13) shows the T_{50}%andT_{90}% of the release profiles. T_{50}%andT_{90}% values varied with varying in the concentration and mixture of super dintegrants (1:1). However, T_{50}%andT_{90}% values are less for the formulations F10 and F12 comparing with marketed formulation and with the all other prepared. While T_{50}%andT_{90}% values did not change with increase in the concentration of crospovidone. The rapid increase in dissolution of pioglitazone in F10 and F12 may be due to rapid swelling of crosscarmellose and sodium starch glycolate. The increase in the concentration of Crosscarmellose and sodium starch glycolate increased the swelling and disintegrating tablets rapidly into apparently primary particles. While tablets formulated with sodium

starch glycolate, disintegrate by rapid uptake of water, followed by rapid and enormous swelling into primary particle but more fastly due to the change in viscous gel layer of sodium starch glycolate by crosspovidone.

Table 1: Tablets prepared by Direct Compression Method

INGREDIENTS	F1	F2	F3	F4	F5	F6
Pioglitazone (mgs)	15	15	15	15	15	15
Cc	6	-	-	9	-	-
Cp	-	6	-	-	9	-
Ssg	-	-	6	-	-	9
Lactose	30	30	30	30	30	30
Mcc	95	95	95	92	92	92
Talc	2	2	2	2	2	2
MgO	2	2	2	2	2	2

Table 2: Tablets prepared by Direct Compression Method using mixture of Super Disintegrants

Ingredients	F7	F8	F9	F10	F11	F12
Pioglitazone	15	15	15	15	15	15
Cc	3	3	-	4.5	4.5	-
Cp	3	-	3	4.5	-	4.5
Ssg	-	3	3	-	4.5	4.5
Lactose	30	30	30	30	30	30
Mcc	95	95	95	92	92	92
Talc	2	2	2	2	2	2
MgO	2	2	2	2	2	2

Note:-CC, CP-4% -F1 (1:1) CC, SSG-4% -F2 (1:1) SSG, CP-4% -F3(1:1)
CC, CP-6% -F4 (1:1) CC, SSG-6% -F5 (1:1) CC, SSG-6% -F5 (1:1)

Table 3: Tablets prepared by Wet Granulation Method using mixture of Super Disintegrants

Ingredients	F13	F14	F15	F16	F17	F18
Pioglitazone	15	15	15	15	15	15
Cc	3	3	-	4.5	4.5	-
Cp	3	-	3	4.5	-	4.5
Ssg	-	3	3	-	4.5	4.5
Lactose	35	35	35	35	35	35
Mcc	95	95	95	92	92	92
Talc	2	2	2	2	2	2
MgO	2	2	2	2	2	2

Table 4: Swelling studies of super disintegrants in purified water.

Super disintegrant	% Increase in volume
Croscarmellose sodium	900
Sodium starch glycolate	650
Crospovidone	2.63

Table 5: Pre-compressional results of Formulations F1 to F6

Parameter	F1	F2	F3	F4	F5	F6
Bulk density(gm/cc)	0.456±0.00825	0.452±0.008	0.448±0.01202	0.461±0.0057	0.445±0.021	0.398±0.012
Tapped Density(gm/cc)	0.553±0.57	0.567±0.32	0.539±0.01	0.547±0.27	0.569±0.38	0.548±0.55
Porosity	18.2±0.182	26.6±5.75	28±0.5773	18.3±0.3341	25±0.5773	28±0.577
Cars index	14.19±0.0408	15.17±0.00826	16.18±0.0168	16.96±0.0760	17.02±1.82	15.19±0.016
Hausners ratio	1.173±0.41	1.192±0.47	1.204±0.38	1.189±0.11	1.186±0.54	1.172±0.33
Dispersibility	82.5±0.3341	75.4±0.577	68.3±1.5275	70.3±0.8822	56.8±1.15	66.3±1.527
Angle of repose(θ)	31.33±0.577	30.14±0.3366	35.23±2.9257	29.14±0.6683	28.22±0.33	29.13±0.883

Table 6: Pre-compressional results of Formulations F7 to F12

Parameter	F13	F14	F15	F16	F17	F18
Bulk density(gm/cc)	0.29 ±0.017	0.34 ±0.017	0.37 ±0.171	0.40 ±0.01	0.36 ±0.01	0.35 ±0.01
Tapped Density (gm/cc)	0.33 ±0.015	0.36 ±0.02	0.39 ±0.015	0.43 ±0.015	0.44 ±0.02	0.37 ±0.159
Porosity	16.2 ±0.346	24.2 ±0.152	24.17 ±0.026	24 ±1.529	25.2 ±0.152	18.2 ±0.173
Cars index	12.12 ±0.01	5.5 ±0.251	5.1 ±0.10	69 ±0.173	18.18 ±0.051	5.40 ±0.133
Hausners ratio	1.13 ±0.015	1.058 ±0.016	1.05 ±0.017	1.07 ±0.01	1.22 ±0.031	1.05 ±0.015
Dispersibility	80.5 ±0.586	65.3 ±0.21	68.2 ±0.305	54.2 ±0.212	65.2 ±0.173	70.2 ±0.32
Angle of repose(θ)	28.6 ±0.336	28.07 ±0.122	28.02 ±0.064	28.88 ±0.0574	22.53 ±0.058	30.54 ±0.167

Table 7: Pre-compressional results of Formulations F13 to F18

Parameters	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**
Angle of repose	37.23 ±0.026	29.68 ±0.33	27.92 ±0.192	34.21 ±0.01	37.59 ±0.519	39.69 ±1.407
Bulk density	0.69 ±0.0348	0.75 ±0.065	0.771 ±0.086	0.725 ±0.0084	0.715 ±0.0046	0.717 ±0.0076
Tapped Density (gm/cc)	0.58 ±0.67	0.67 ±0.22	0.59 ±0.11	0.57 ±0.23	0.69 ±0.28	0.58 ±0.45
Porosity	21 ±0.577	32.33 ±0.666	28 ±0.288	35.66 ±0.1414	35.3 ±0.2302	25.33 ±0.342
Carr's index	24.6 ±0.336	20.66 ±0.6645	10.33 ±0.333	12 ±0.318	11.16 ±0.118	20.33 ±0.331
Hausners Ratio	1.17 ±0.31	1.21 ±0.27	1.19 ±0.48	1.197 ±0.21	1.175 ±0.34	1.183 ±0.23
Dispersibility	81.6 ±0.066	94.53 ±0.1187	89.53 ±0.459	82.83 ±0.070	95.3 ±0.333	94.6 ±0.230

Table 8: Post-compressional results of Formulations F1 to F6

Parameters	**F_1**	**F_2**	**F_3**	**F_4**	**F_5**	**F_6**
Hardness(kg/cm^2) (ïSD), n=3	3.2 ±0.013	3.3 ±0.032	3.5 ±0.021	3.8 ±0.028	3.3 ±0.038	3.1 ±0.051
Friability (%) (ïSD), n=3	0.78 ±0.5773	0.71 ±0.0411	0.65 ±0.0530	0.48 ±0.4966	0.95 ±0.5123	0.35 ±0.5211
Weight variation (mg)(ïSD), n=20	Passes	Passes	Passes	Passes	Passes	Passes
Uniformity of Dispersion	Passes	Passes	Passes	Passes	Passes	Passes
Thickness (mm) (ïSD), n=4	4.12± 0.05	4.01± 0.03	4.13± 0.23	4.02± 0.17	3.9± 0.21	4.04±0.43
Disintegration Time(sec)	64 ±0.22	69 ±0.32	72 ±0.57	57 ±1.5	54 ±0.18	58 ±0.22
Wetting Time (Sec)	44 ±0.136	48 ±0.24	42 ±0.17	47 ±0.49	39 ±0.27	46 ±0.344
Drug content (%)	97.5 ±0.22	98.6 ±0.42	97.9 ±0.18	98.2 ±0.76	98.1 ±0.75	97.5 ±0.29

Table 9: Post-compressional results of Formulations F7 to F12

Parameters	F7	F8	F9	F10	F11	F12
Hardness(kg/cm^2) (ïSD), n=3	3.6 ±0.0443	4.8 ±0.0378	4.9 ±0.0223	5.0 ±0.0278	4.1 ±0.338	3.9 ±0.0511
Friability (%) (ïSD), n=3	0.75 ±0.5773	0.69 ±0.0411	0.43 ±0.0530	0.21 ±0.4966	0.97 ±0.5123	0.14 ±0.5211
Weight variation (mg)(ïSD), n=20	Passes	Passes	Passes	Passes	Passes	Passes
Uniformity of Dispersion	Passes	Passes	Passes	Passes	Passes	Passes
Thickness (mm) (ïSD), n=4	4.28(0.05)	4.35(0.05)	4.33(0.05)	4.25(0.17)	4.32(0.18)	4.24(0.03)
Disintegration Time(sec)	45 ±0.22	48 ±0.32	44 ±0.57	31 ±1.5	35 ±0.18	39 ±0.22
Wetting Time (Sec)	32 ±0.336	28 ±0.346	32 ±0.397	27 ±0.399	30 ±0.397	24 ±0.344
Drug content (%)	99.5 ±0.52	99.6 ±0.62	98.9 ±0.58	100.2 ±0.68	98.9 ±0.57	101.0 ±0.81

Table 10: Post-compressional results of Formulations F13 to F18

	Wet Granulation					
PARAMETERS	**F13**	**F14**	**F15**	**F16**	**F17**	**F18**
Hardness(kg/cm^2) (±SD), n=3	3.9 ±0.1	4.6 ±0.15811	4.8 ±0.1732	4.9 ±0.21213	4.0 ±0.158	3.8 ±0.212
Friability (%) (±SD), n=3	0.74 ±0.4211	0.68 ±0.0423	0.40 ±0.0213	0.20 ±0.4211	0.95 ±0.213	0.14 ±0.131
Weight variation (mg)(±SD), n=20	Passes	Passes	Passes	Passes	Passes	Passes
Uniformity of Dispersion	Passes	Passes	Passes	Passes	Passes	Passes
Thickness (mm) (±SD), n=4	4.25 (0.04)	4.33 (0.03)	4.32 (0.04)	4.20 (0.02)	4.32 (0.08)	4.23 (0.04)
Disintegration Time (sec) (±SD), n=6	45 ±1.5	49 ±1.52	54 ±0.21	48 ±0.42	42 ±0.32	46 ±0.24
Wetting Time (Sec) (±SD), n=6	30 ±0.29	25 ±0.32	31 ±0.24	26 ±0.23	28 ±0.32	22 ±0.149
Drug content (%) (±SD), n=6	96.5 ±0.23	98.6 ±0.42	96.9 ±0.53	99.2 ±0.62	100.4 ±0.58	99.2 ±0.32

Table 11A: Dissolution studies of pioglitazone by direct compression method & wet granulation method (phosphate buffer) with different methods of super disintegrants addition (pH-6.8)

	Direct Compression					
Time intervals	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**
5min	59.26 ±0.11	61.93 ±0.21	58.92 ±0.23	66.51 ±0.30	60.22 ±0.22	69.32 ±0.12
10min	64.10 ±0.26	68.72 ±0.25	63.98 ±0.17	71.07 ±0.19	65.11 ±0.21	74.86 ±0.18
15min	69.44 ±0.15	78.31 ±0.18	72.64 ±0.24	80.35 ±0.18	71.65 ±0.19	83.0 ±0.14
20min	75.74 ±0.21	84.75 ±0.22	78.4 ±0.23	87.88 ±0.15	78.54 ±0.14	88.42 ±0.16
25min	85.43 ±0.15	89.97 ±0.16	86.8 ±0.16	94.36 ±0.24	84.62 ±0.24	96.58 ±0.29
30min	93.24 ±0.15	94.23 ±0.16	92.9 ±0.11	98.93 ±0.14	89.63 ±0.13	99.2 ±0.20

Table 11B: Dissolution studies of pioglitazone by direct compression method & wet granulation method (phosphate buffer) with different methods of super disintegrants addition (pH-6.8)

	Wet Granulation						
Time intervals	**F13**	**F14**	**F15**	**F16**	**F17**	**F18**	**Marketed Fmltn**
5min	60.33 ±0.24	38.46 ±0.32	52.34 ±0.28	46.84 ±0.204	26.34 ±0.17	48.22 ±0.21	65.30 ±0.14
10min	67.285 ±0.282	42.32 ±0.182	56.73 ±0.234	50.64 ±0.234	28.46 ±0.26	58.43 ±0.148	71.42 ±0.22
15min	83.06 ±0.132	54.66 ±0.14	57.93 ±0.182	54.24 ±0.182	34.49 ±0.21	68.93 ±0.23	77.18 ±0.12
20min	83.93 ±0.042	58.28 ±0.162	59.84 ±0.23	56.94 ±0.23	38.39 ±0.16	70.44 ±0.36	83.15 ±0.21
25min	84.66 ±0.132	69.0 ±0.156	63.86 ±0.24	63.86 ±0.24	46.34 ±0.023	82.46 ±0.042	96.33 ±0.30
30min	86.23 ±0.23	71.42 ±0.15	69.42 ±0.0216	69.42 ±0.0216	52.09 ±0.042	84.31 ±0.282	97.32 ±0.29

Table 12: Analysis of calibration curve data for Pioglitazone in 7.4 phosphate buffer at 269.0 nm.

S.No.	Concentration (mcg /ml)	Absorbance Mean (± SD), n=3
1	0	0 ±0.00
2	2	0.0143 ± 0.0011
3	4	0.0478 ± 0.0028
4	6	0.0737 ±0.0028
5	8	0.0961±0.0011
6	10	0.1305±0.0046

4. Conclusion

Fast dissolving tablets constitute an innovative dosage form, which overcomes the problem of swallowing and provides a quick onset of action. The paediatric and geriatric populations are the primary. Targets, as both the groups found it difficult to swallow conventional tablets. The basic approach followed by all the currently available technologies engaged in the formulation of Fast dissolving tablets is to maximize the porous structure of the tablet matrix and incorporate super disintegrating agents in optimum concentration so as to achieve rapid disintegration and instantaneous dissolution of the tablet along with good taste masking properties and excellent mechanical strength The availability of the various technologies and manifold advantages of Fast dissolving tablets will surely increase its popularity in the near future An Attempt was made to improve the disintegration capacity and Dissolution efficiency of the prepared formulations with the use of mixture of super disintegrants. Pioglitazone prepared alone with super disintegrants has shown the less release profile when compared to the release profile shown by the formulations with mixture of super disintegrants. The introduction of fast dissolving dosage forms has solved some of the problems encountered in administration of drugs to the pediatric and elderly patient, which constitutes a large proportion of the world's population. Hence, patient demand and the availability of various technologies have increased the market share of Fast dissolving tablets, which in turn prolongs the patent life of a drug. Keeping in view of the advantages of the delivery system, rapidly disintegrating dosage forms have been successfully commercialized

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