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Formulation and Evaluation of Orally Disintegrating Tablet of Diclofenac Sodium for Rapid Pain Relief

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ABSTRACT

Orally disintegrating tablets of diclofenac sodium were prepared by direct compression method using polyplasdone xl-10 and croscarmellose sodium as a superdisintegrants. Microcrystalline cellulose was used as diluent and dextrose, as sweetening agent. Tablets were evaluated for weight variation; weight variation of all formulations was observed which are within the acceptable limit for uncoated tablets as per United States Pharmacopoeia. Mechanical **s**trength and hardness of tablets was determined and was found to be in the range of 3.4 to 3.6 Kg/Cm^2. *In vitro* disintegration time, the formulation containing polyplasdone xl-10 and croscarmellose sodium with different concentration was found to be in the range of 54.66 to 27.40 seconds for formulation F4 and F5 respectively. Wetting time for all formulations was found to be 4.50±0.40 to 6.00±0.24 seconds. The cumulative percentage of drug release for formulations F1-F5. It was observed that in first 2 minutes, only 24.34% for drug release from formulation F1 by using 10% of croscarmellose sodium, while it was 86.65% in the case of formulation F5 by using 20% of polyplasdone xl-10 and 10% croscarmellose sodium. The result of *in vitro* disintegration time shows that formulation F5 containing 20% polyplasdone xl-10 was 27.40 seconds. Polyplasdone xl-10 was found to have super disintegrant property, the addition technique is the best method for preparing orally disintegrating tablet for rapid pain relief.

1. INTRODUCTION

Oral drug delivery is nowadays gold standard in pharmaceutical industry regarded as safest and most economical method with highest patient compliance. A novel concept which offers ease of oral administration of a tablet which dissolves or disintegrates rapidly in mouth in >60 sec without swallowing. The formulation does not require use of effervescent excipients and disintergrant and yet faster disintegration profile compare to other competitor technologies. A novel orodispersible formulation may also be applied to deliver therapeutic agents through buccal mucosa directly to systemic circulation there by avoiding the first pass metabolism adds an advantage[1].

Superdisintegrants like croscarmellose, crosspovidone, sodium starch glycolate which represent example of a cross linked cellulose, cross linked polymer and a cross linked starch respectively, these superdisintegrants act by swelling and due to swelling pressure exerted in the outer direction or radial direction, it causes tablet to burst or the accelerated absorption of water leading to an enormous increase in the volume of granules to promote disintegration[2,3]. Orodispersible tablets are not only indicated for people who have swallowing difficulties, but also are ideal for active people [4].

Diclofenac sodium is traditional non steroidal anti-inflammatory (NSAIDS) affords quick relief of pain and wound edema [5,6]. The main objective behind formulation of such a dosage form will definitely get futile. Thus in the present study an attempt has been made to mask the taste of Diclofenac sodium and to formulate ODTs with good mouth feel so as to prepare a "patient-friendly dosage form".

The study was proposed to formulate an oral delivery device, in the form of fast disintegrating tablets by using direct compression technology [7], with the aim of reaching a high serum concentration in a short period of time [8], croscarmellose sodium and polyplasdone xl-10 were used as superdisintegrants.

2. MATERIALS AND METHODS

2.1 Materials

Diclofenac sodium (Mac D, Indore), croscarmellose sodium and polyplasdone xl-10 (Concept Pharma. Ltd. Aurangabad, India), Dextrose, microcrystalline cellulose, magnesium stearate, vanillin, menthol and sodium saccharine from S.D Fine Chem. Mumbai.

2.2 Methods

2.2.1 Preparation and blends

Tablets containing 50mg of Diclofenac sodium are prepared by direct compression method and the various formulae used in the study are shown in Table I. The drug, diluents, superdisintegrants and sweetener are passed through sieve # 60. All the above ingredients were properly mixed together (in a poly-bag). Talc and magnesium stearate were passed through sieve # 30, mixed and blended with initial mixture in apoly-bag. The powder blend was compressed in to tablets on twelve station rotary punch-tabletting machine (Karnavati, Rimek Mini Press- 2).

2.2.2. Evaluation of tablets

All tablets were evaluated for different parameters as weight variation, hardness, friability, uniformity of weight, disintegration time, wetting time, drug content and *in- vitro* dissolution study [9,10] Table II.

2.2.3. Weight Variation

Twenty tablets were selected randomly from the lot and weighed individually to check for weight variation and then the average weight was determined and compared with average weight of the positive and negative deviation. The tablets meet USP specifications.

2.2.4. Hardness and friability

The hardness of the prepared tablets was determined using a Monsanto hardness tester, which also measures the tablet diameter. Ten tablets were tested for hardness from each batch and the mean and SD were calculated. Pre-weighed 20 tablets were placed in a plastic chambered

friabilator (Roche) attached to a motor revolving at a speed of 25 rpm for 4 min. The tablets were then de-dusted, reweighed and percentage mass loss (friability) was calculated.

2.2.5. Wetting time

A piece of double folded tissue paper was placed in a Petri plate (internal diameter is 6.5cm) containing 6ml of water. The tablet was placed on the paper and the time for complete wetting of the tablet was measured in minutes Figure I.

2.2.6. Disintegration time

In vitro disintegration time of the prepared tablets was carried out at 37 ± 0.5°C in 900ml of distilled water using a disintegration test apparatus. Disintegration time of 6 individual tablets was recorded at 37 ± 0.5°C in 900ml of distilled water Figure II.

2.2.7. Drug content

Twenty tablets were weighed and powdered. An amount of the powder equivalent to 50mg of diclofenac sodium was dissolved in 100ml of pH 7.4 phosphate buffer, filtered, diluted suitably and analyzed for drug content at 283nm using UV-Visible spectrophotometer.

2.2.8. *In-vitro* drug release studies

In-vitro drug release studies of all the formulations were carried out using tablet dissolution test apparatus (USP XXII type) at 50rpm. Phosphate buffer pH7.4 was used as the dissolution media with temperature maintained at 37 ± 0.5°C. Samples were withdrawn at different intervals, diluted suitably and analyzed at 283nm for cumulative drug release using Shimadzu UV-Visible spectrophotometer Figure III.

2.2.9.FT-IR Study

The pure drug diclofenac sodium and the solid admixture of drug and various excipients used in the preparation of fast dispersible tablet formulations were characterized by IR spectroscopy to know the compatibility. Study did not show any possibility of interaction between diclofenac sodium and superdisintegrants used in the fast disintegration tablets.

3. RESULTS AND DISCUSSION

Before formulating, preformulation study has been performed, drug excipients (1:1) mixture of (drug: superdisintegrant) compatibility study by using IR spectrophotometer (Model-Spectrum Rx, Perkin Elmer) has been studied. There are not any changes in functional groups of the drug. The powder mixture shows good flow properties, Low Hausner ratio (1.34), compressibility index (25.33) and angle of repose (18.54), these values indicate that the powder is having fairly good flowability properties. All the formulations were prepared under similar conditions to avoid processing variables.

Weight variation of the tablets 2.34% which is within the limit (> 5%). Hardness of the tablets was (3.5 ± 0.33) $Kg.cm^2$. The friability loss of the tablets was (0. 89 ± 0.98%).The drug content of all formulations was found to be in the range of (99.80± 0.48%) which was within acceptable limit. The most important parameter that needs to be developed for the fast dispersible tablet is the disintegration time. In the present study all the formulations disintegrated within (140sec), which fulfills the official requirement (> 3 min). Fig .2 shows the disintegration behavior of the all formulations. It is observed that disintegration time of formulations F1 to F5 decreased (from 147.33 to 27.40 sec), formulation containing increased level of polyplasdone xl-10 shows the disintegration time 27.40 sec. Polyplasdone xl-10 has rapid capillary activity and pronounced hydration with little tendency to gel formation Fig.II.

Dissolution process of the tablet depends on wetting followed by disintegration of the tablet. The measurement of wetting time may be useful as another confirmative test for the evaluation of fast dispersible tablet. Fig.3 shows wetting time of various formulations. Wetting time was found to be (4.50±0.40 to 6.00±0.24). The t50% and t80% values decreased with increasing the concentration of polyplasdone xl-10. *In-vitro* dissolution study was performed for all formulations, shown in Fig 3. It is observed that formulation F1 gave only 24.34% drug release in first 2min. Optimized formulation (F5) containing 50mg of polyplasdone xl-10 and croscarmellose sodium 25mg revealed that more than 80% drug was released within 1.94min. This shows that Polyplasdone xl-10 and croscarmellose sodium has significant effect on rapid release of drug.

Table I. FORMULAE USED IN THE PREPARATION OF TABLETS

Ingredients (mg)	**Formulation Code**				
	F1	**F2**	**F3**	**F4**	**F5**
Diclofenac sodium	50	50	50	50	50
Dextrose	126	101	101	76	76
Croscarmellose sodium	25	50	25	50	25
Polyplasdone xl-10	-	-	25	25	50
Microcrystalline cellulose	25	25	25	25	25
Magnesium stearate	1.5	1.5	1.5	1.5	1.5
Sodium saccharine	10	10	10	10	10
Vanillin	5	5	5	5	5
Menthol	6	6	6	6	6

Table II. CHARACTERIZATION OF FAST DISSOLVING TABLETS.*Values are expressed as mean ± SD. n=3

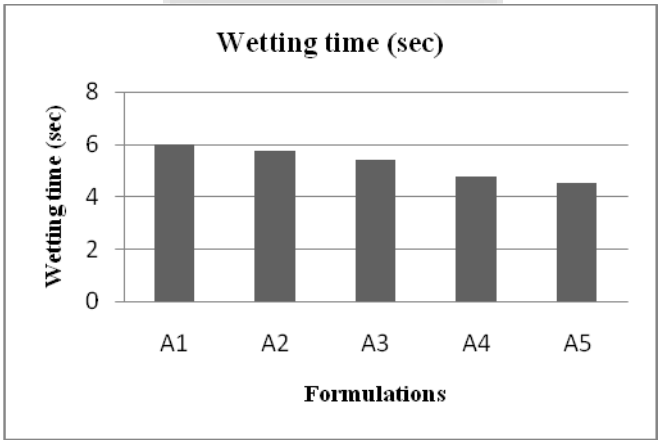

Fig. I. COMPARISON OF WETTING TIME OF DIFFERENT FORMULATIONS.

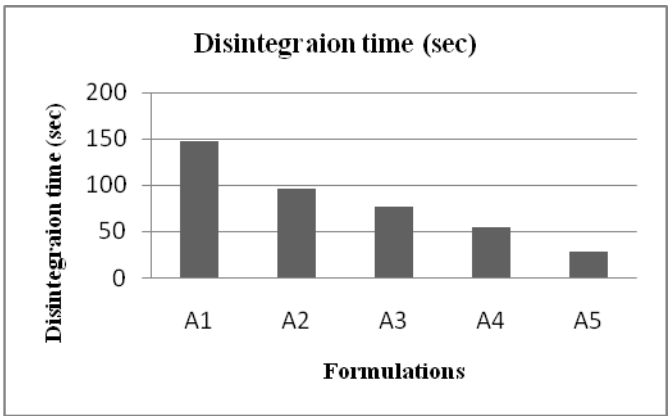

Fig. II. COMPARISON OF DISINTEGRATION TIME OF DIFFERENT FORMULATIONS.

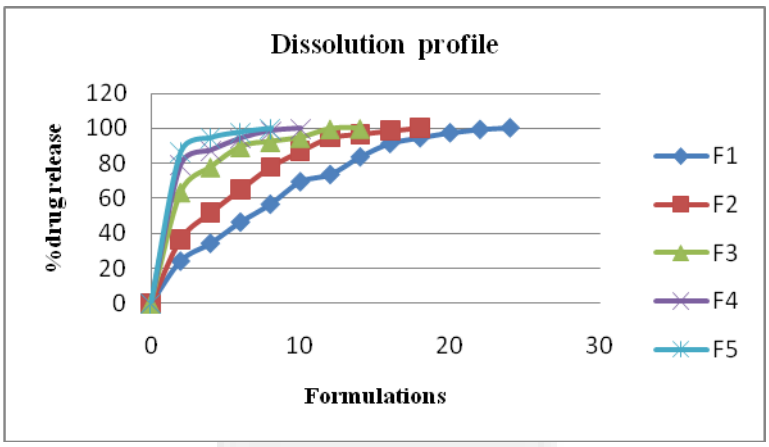

Fig. III. COMAPRISION OF DISSOLUTION PROFILE OF DIFFERENT FORMULATIONS

4. CONCLUSION

Study reveals that superdisintegrants are necessary for the preparation of fast disintegrating tablets, study shows that formulations superdisintegrants like polyplasdone xl-10 and croscarmellose sodium had acceptable hardness, weight variation and friability. Superdisintegrant based fast disintegrating tablets of diclofenac sodium would be quite effective, providing quick relief from pain without need for water for swallowing or administration.

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REFERENCES

[1] Tuohy G. Orodispersible tablet technology,RCSI technology transfer.2010:1-2
[2] Schimidt P.C and Brogramann B. Superdisintegrants. Acta. Pharm. Technol.1988:34:22
[3] Cohen Y and Lach J.L.J. Pharm. Sci,(52),1963,122
[4] Dandagi P.M , Mastiholimath V.S, SrinivasS.A, Gadad A.P, Godbole A.M, Hiremath S.P"et al". Orodispersible Tablets: New-fangled Drug Delivery System-A Review. Indian J.Pharm. Educ.2005:39(4): 177-181
[5] Tripathi KD.Essentials of medical pharmacology. 6th ed.Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.2008:184-206
[6] Rang HP, Dale MM, Ritter JM, Flower RJ, Rang and Dale's Pharmacology, 6thed.ChurchillLevingstone Elsevier .2007:227-233.
[7] Rajnibala, Shailesh S, Neelam S, Ghanshyam D G.Development of Non-Bitter Zolpidem Tartrate Mouth Dissolving Tablet.J.Pharm. Res.2009: 2(9):1530-1535
[8] Mukesh P, Ratnaparkhi, MohantaGP,Lokesh U. Review On: Fast Dissolving Tablet.J. Pharm. Res.2009:2(1),5-12.
[9] Margret CR, Venkataeswarlu BS, KumudhavalliMV,Debjitbhowmik , Jayakar B. Formulation and evaluation of mouth dissolving tablets of the etoricoxib. Pak J Pharm Sci.2010:23(2):178-181.
[10] Dandag P, Halakatti P, Mastiholimath V, Patil M, Manvi F. Rapidly disintegrating domperidone tablets. Indian drugs.2006:43(7): 594-597