Research Article **CODEN: AJPCFF** **ISSN: 2321 – 0915**

Asian Journal of Phytomedicine and Clinical Research

Journal home page: www.ajpcrjournal.com

https://doi.org/10.36673/AJPCR.2021.v09.i03.A15

FORMULATION DEVELOPMENT AND *IN-VITRO* EVALUATION OF FAST DISINTEGRATING TABLETS OF ZIPROSIDONE BY USING DIFFERENT DISINTEGRATING AGENTS

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ABSTRACT

The present work was investigates that enhancement of dissolution profile of Ziprasidone by using super disintegrants like croscaramellose sodium and sodium starch glycolate. Ziprasidone fast disintegrating tablets (FDT) can be prepared direct compression method. Effect of disintegrants on disintegration and dissolution parameters were studied. Disintegrating time and dissolution parameter (T50% and T90%) decreased with increases in the level of croscarmellose sodium and sodium starch glycolate. It was concluded that the ZF6 formulation with croscaramellose sodium (6%) as super disintegrating agent shows good drug release on ziprasidone tablet formulation.

KEYWORDS

Ziprasidone, Disintegrating, Croscarmellose sodium and Sodium starch glycolate.

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INTRODUCTION

Tablet is defined as solid pharmaceutical dosage form containing drug substance with or without suitable diluents and prepared by compression or molding methods. They have been widespread use since the later part of the 19th century and their popularity continues.

The conventional dosage forms produce wide ranging fluctuation in drug concentration in blood stream and tissues with consequent undesirable toxicity and poor efficiency.

The oral route of administration is a very significant route of administering drugs for systemic effects. The oral dosage forms are so prolific that their supremacy is not likely to face my any serious challenges. New drug entities have the therapeutic advantages of controlled drug delivery, greater attention have been focused on development of sustained or controlled release drug delivery systems.

Tablets remain popular as a dosage form because of the advantages afforded both to the manufacturer (e.g. simlicity and economy of the preparation, stability and convenience in packing, shipping and dispensing) and the patient (e.g. accuracy of dosage, compactness, portability, blankness of taste and ease of administration).

Although tablets frequently are discoid in shape, they also may be round, oval oblong, cylindrical or triangular. They may differ greatly in size and weight depending on the amount of the drug substance present and the intended method of administration. They are divided in to two general classes by whether they made by compression or molding. Compressed tablets usually are prepared by large-scale production methods, while moulded tablets generally involve small-scale operations.

Tablet formulation and design may be described as the process whereby the formulator ensures that the current amount of the drug in the right form is delivered. Most recently, new concepts and federal regulations being made on bioavailability and bioequivalence and on validation, are impacting on tablet formulation, design and manufacturing.

Properties of Tablets

The attributes of an acceptable tablet are as follows:

- The tablet must be sufficiently strong and resistance to shock and absorption and to withstand handling during manufacturing, packing, shipping and use.
- Tablet must be uniform in weight and in drug content of the individual tablet. This is measured by the weight variation test and content uniformity tests.
- The drug content of the tablet must be bioavailable. This property is measured bythe dissolution test. Accurate bioavailability can be obtained from the drug levels of the drug after its administration.
- Tablet must be elegant in appearance and must have characteristic shape, color.
- And other markings necessary to identify the product.
- Tablets must retain all these functional attributes, which include drug stability and efficacy.

METHODS OF FORMULATION

The tablets can be formulated by direct compression method by using the following method.

Method

In this method the drug pass through the sieve no: 40 and retention on sieve no: 60 is taken for the formulation. The polymers were weighed in require quantities. The drug and polymers are mixed well. Then finally the drug polymer mixture is compressed as tablets.

KINETICS OF DRUG RELEASE

The order of drug release can be assessed by graphical treatment of drug release data.

Table No.1: Formula for the Preparation of ziprasidone tablets

S.No	Ingredients	Formulations						
		ZF1(mg)	ZF2 (mg)	ZF3 (mg)	ZF4 (mg)	ZF5 (mg)	ZF6 (mg)	ZF7 (mg)
1	Ziprasidone	20	20	20	20	20	20	20
2	Sodium starch Glycolate	4	8	12	-	-	-	-
3	Croscaramellose Sodium	-	-	-	4	8	12	-
4	Microcrystalline Cellulose	126	122	118	126	122	118	130
5	Mannitol	30	30	30	30	30	30	30
6	Camphor	10	10	10	10	10	10	10
7	Magnesium Stearate	5	5	5	5	5	5	5
8	Talc	5	5	5	5	5	5	5

IN VITRO DISSOLUTION STUDIES OF FORMULATION BATCHES

Table No.2: Dissolution studies of formulations

S.No	Formulationcode	% drug release			
		05 (min)	10 (min)	15 (min)	20 (min)
1	ZF1	51.8	61.6	70.2	81.7
2	ZF2	56.5	64.9	72.6	84.3
3	ZF3	58.1	67.1	77.3	89.7
4	ZF4	58.0	62.7	72.6	83.9
5	ZF5	60.5	70.4	79.5	92.3
6	ZF6	63.8	74.0	81.0	94.5
7	ZFC7	35.1	48.1	55.4	67.1

Formulation-1

Cumulative % Drug Release of ZF1 Formulationof Ziprasidone fast disintegrating Tablets

Table No.3: Cumulative % Drug Release of ZF1

S.No	Time(MNI)	Square root time	Log time	% Drug release	Drugun release	Log % Drug release	Log % Drugun release
1	5	2.23	0.69	51.8	48.2	1.71	1.68
2	10	3.16	1.0	61.6	38.4	1.78	1.58
3	15	3.87	1.17	70.0	30.0	1.84	1.47
4	20	4.47	1.30	81.7	18.3	1.91	1.26

Cumulative % Drug Release of ZF2 Formulation of Ziprasidone fast disintegrating Tablets

Table No.4: Cumulative % Drug Release of ZF2

S.No	Time (MNI)	Square root time	Log time	% Drug release	% Drugun release	Lo% Drug release	Log % Drugun release
1	5	2.23	0.69	56.5	43.5	1.75	1.63
2	1 0	3.16	1.0	64.9	35.1	1.81	1.54
3	15	3.87	1.17	72.6	27.4	1.86	1.43
4	20	4.47	1.30	84.3	15.7	1.92	1.19

Formulation-3

Cumulative % Drug Release of ZF3 Formulationof Ziprasidone fast disintegrating Tablets

Table No.5: Cumulative % Drug Release of ZF3

S.No	Time (MNI)	Square root time	Log Time	% Drug release	% Drugun release	Lo% Drug release	Log % Drugun release
1	5	2.23	0.69	58.0	42.0	1.76	1.62
2	1 0	3.16	1.0	67.1	32.9	1.82	1.51
3	15	3.87	1.17	77.3	22.7	1.88	1.35
4	20	4.47	1.30	89.7	10.3	1.95	1.01

Formulation-4

Cumulative % Drug Release of ZF4 Formulation of Ziprasidone fast disintegrating Tablets

Table No.6: Cumulative % Drug Release of ZF4

S.No	Time(MNI)	Square root time	Log time	% Drug release	% Drugun release	Lo% Drug release	Log % Drugun release
1	5	2.23	0.69	58.0	42.0	1.76	1.62
2	1 0	3.16	1.0	62.7	37.3	1.79	1.57
3	15	3.87	1.17	72.6	27.4	1.86	1.43
4	20	4.47	1.30	83.9	16.1	1.92	1.20

Cumulative % Drug Release of ZF5 Formulation of Ziprasidone fast disintegrating Tablets

Table No.7: Cumulative % Drug Release of ZF5

S.No	Time(MNI)	Square root time	Log time	% Drug release	% Drugun release	Lo% Drug release	Log % Drugun release
1	5	2.23	0.69	60.5	39.5	1.78	1.59
2	1 0	3.16	1.0	70.4	29.6	1.84	1.47
3	15	3.87	1.17	79.5	20.5	1.90	1.31
4	20	4.47	1.30	92.3	7.7	1.96	0.88

Formulation-6

Cumulative % Drug Release of ZF6 Formulation of Ziprasidone fast disintegrating Tablets

Table No.8: Cumulative % Drug Release of ZF6

S.No	Time(MNI)	Square root time	Log time	% Drug release	% Drugun release	Lo% Drug release	Log % Drugun release
1	5	2.23	0.69	63.8	36.2	1.80	1.55
2	1 0	3.16	1.0	74.2	25.8	1.87	1.41
3	15	3.87	1.17	81.0	19.0	1.90	1.27
4	20	4.47	1.30	94.5	5.5	1.97	0.74

Formulation-7

Cumulative % Drug Release of ZFC7 Formulation of Ziprasidone fast disintegrating Tablets

Table No.9: Cumulative % Drug Release of ZFC7

S.No	Time(MNI)	Square root time	Log time	% Drug release	% Drugun release	Lo% Drug release	Log % Drugun release
1	5	2.23	0.69	35.1	64.9	1.54	1.55
2	1 0	3.16	1.0	48.1	51.9	1.68	1.41
3	15	3.87	1.17	55.4	44.6	1.74	1.64
4	20	4.47	1.30	67.1	32.9	1.82	1.51

S OF ZF1, ZF2, ZF3, ZF4, ZF5, ZF6, ZFC7 FORMULATIONS

Table No.10: T50 values of ZF1, ZF2, ZF3, ZF4, ZF5, ZF6, ZFC7

S.No	Formulation code	T50 values (min)	T90 values (min)
1	ZF1	4.8	22
2	ZF2	4.4	21.3
3	ZF3	4.3	20
4	ZF4	4.3	21.4
5	ZF5	4.1	19.5
6	ZF6	3.9	19
7	ZFC7	7.1	26.8

T50 VALUES OF ZF1, ZF2, ZF3, ZF4, ZF5, ZF6, ZFC7 FORMULATIONS

Table No.11: T50 values of ZF1, ZF2, ZF3, ZF4, ZF5, ZF6, ZFC7

S.No	Formulation code	T50 values (min)	T90 values (min)
1	ZF1	4.8	22
2	ZF2	4.4	21.3
3	ZF3	4.3	20
4	ZF4	4.3	21.4
5	ZF5	4.1	19.5
6	ZF6	3.9	19
7	ZFC7	7.1	26.8

Table No.12: Correlation coefficient values of All Formulations

S.No	Formulation Code	Zero order R^2	First order R^2
1	ZF1	0.770	0.940
2	ZF2	0.795	0.960
3	ZF3	0.818	0.929
4	ZF4	0.785	0.913
5	ZF5	0.808	0.922
6	ZF6	0.785	0.876
7	ZFC7	0.899	0.983

DISSOLUTION PROFILE OF ZF1, ZF2, ZF3 FORMULATIONS

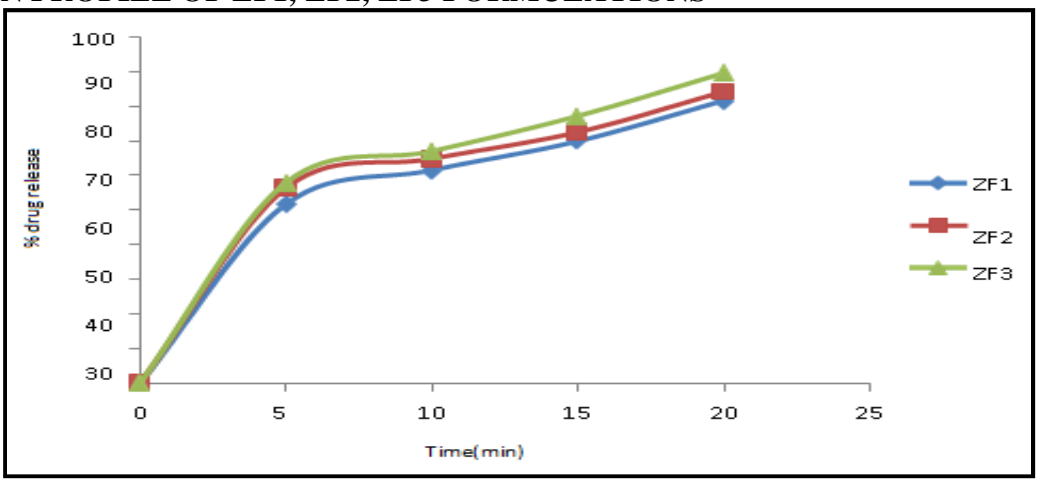


Figure No.1: Graph Showing Dissolution profile of ZF1, ZF2, ZF3 Formulations

DISSOLUTION PROFILE OF ZF4, ZF5, ZF6, FORMULATIONS

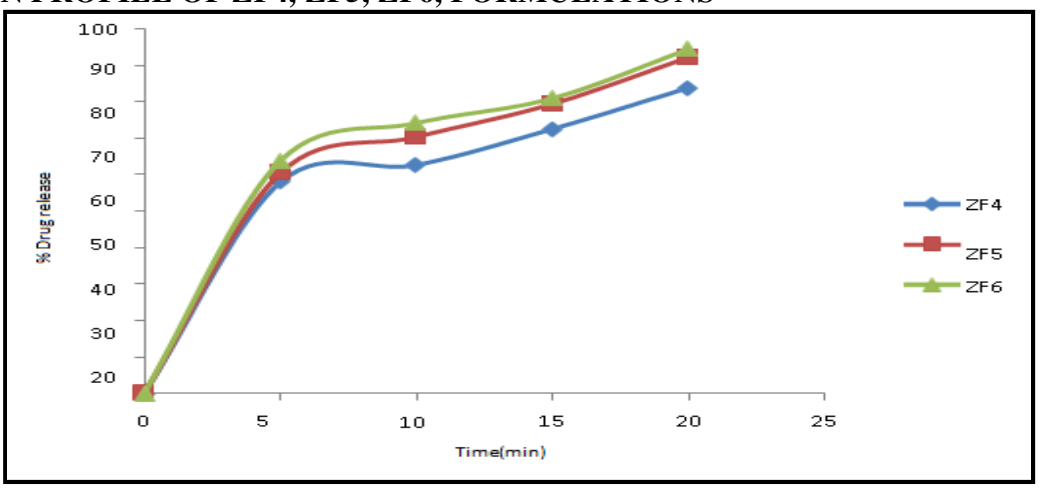


Figure No.2: Graph Showing Dissolution profile of ZF4, ZF5, ZF6 Formulations

DISSOLUTION PROFILE OF ZFC7 FORMULATION

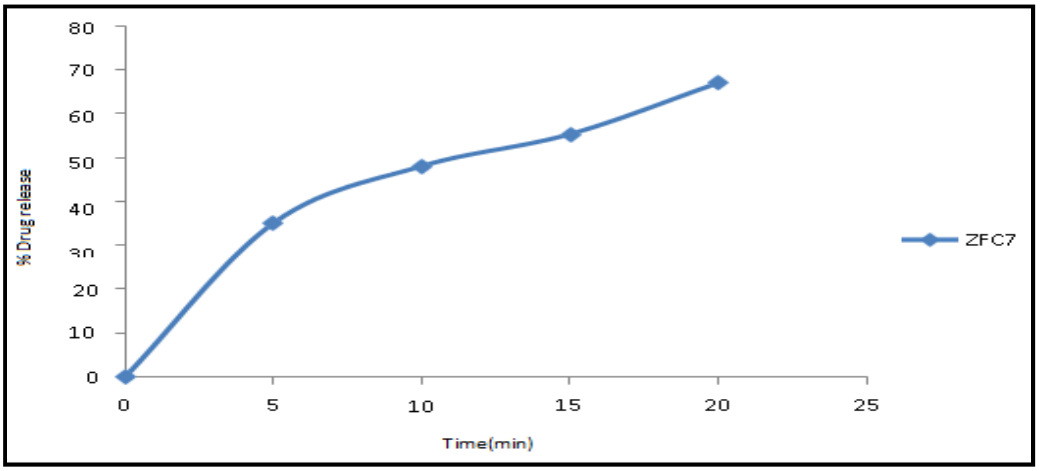


Figure No.3: Graph Showing Dissolution profile of ZFC7 Formulations

Graph Showing the Drug release pattern of ZF1 Formulation of Ziprasidone fastdisintegrating Tablets

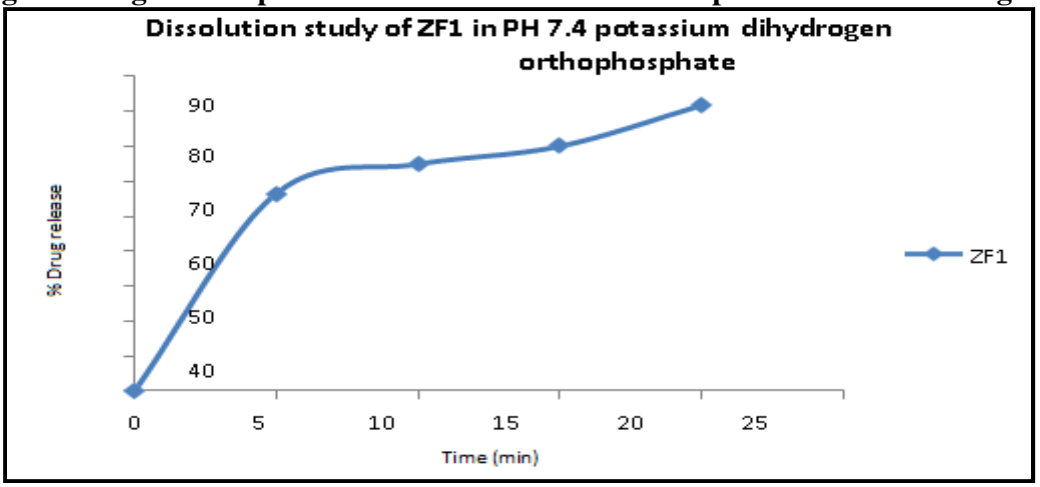


Figure No.4: Graph Showing the Drug release pattern of ZF1 Formulation

Graph Showing the Drug release pattern of ZF2 Formulation of Ziprasidone fastdisintegrating Tablets

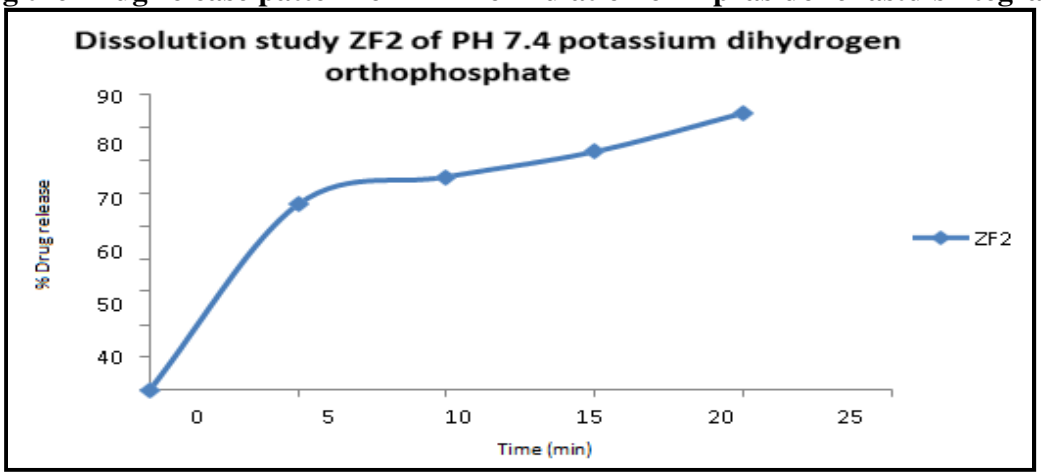


Figure No.5: Graph Showing the Drug release pattern of ZF2 Formulation

Graph Showing the Drug release pattern of ZF3 Formulation of Ziprasidone fastdisintegrating Tablets

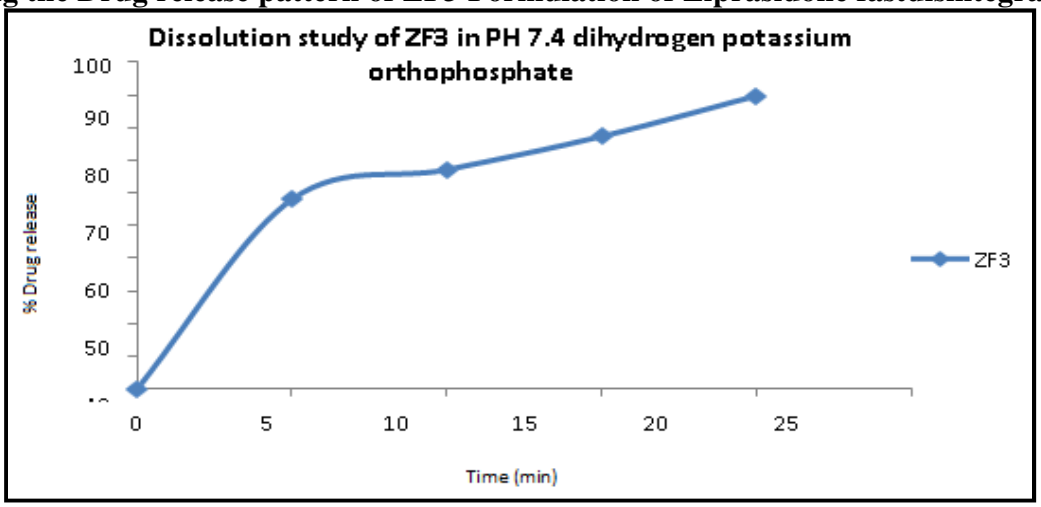


Figure No.6: Graph Showing the Drug release pattern of ZF3 Formulation

Graph Showing the Drug release pattern of ZF4 Formulation of Ziprasidone fastdisintegrating Tablets

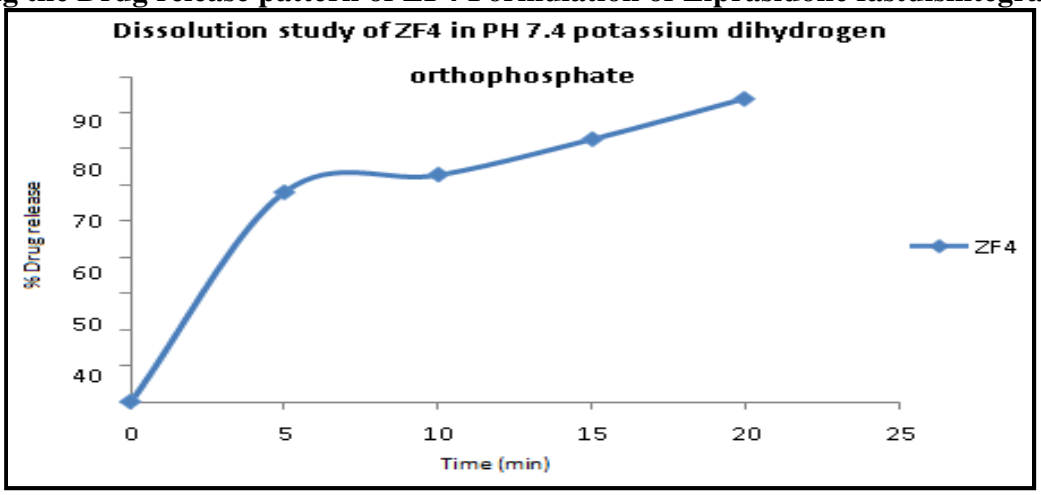


Figure No.7: Graph Showing the Drug release pattern of ZF4 Formulation

Graph Showing the Drug release pattern of ZF5 Formulation of Ziprasidone fastdisintegrating Tablets

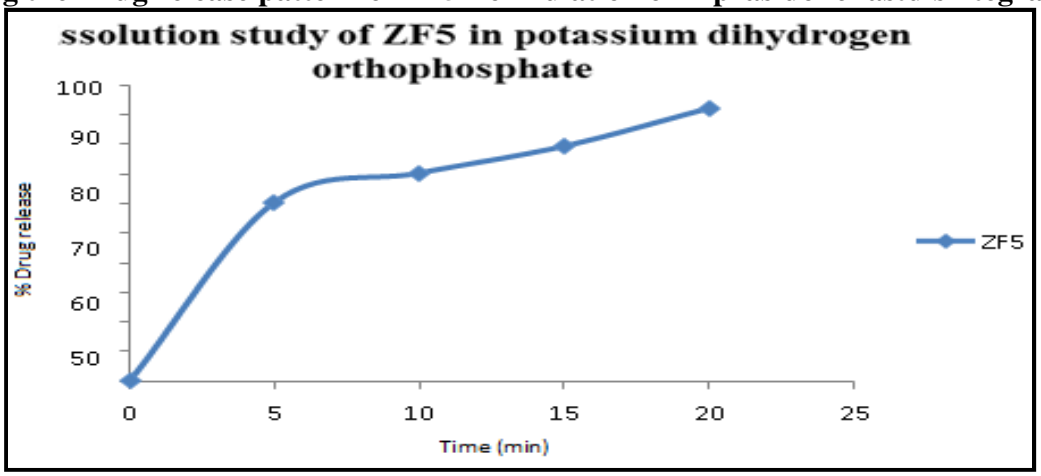


Figure No.8: Graph Showing the Drug release pattern of ZF5 Formulation

Graph Showing the Drug release pattern of ZF6 Formulation of Ziprasidone fastdisintegrating Tablets

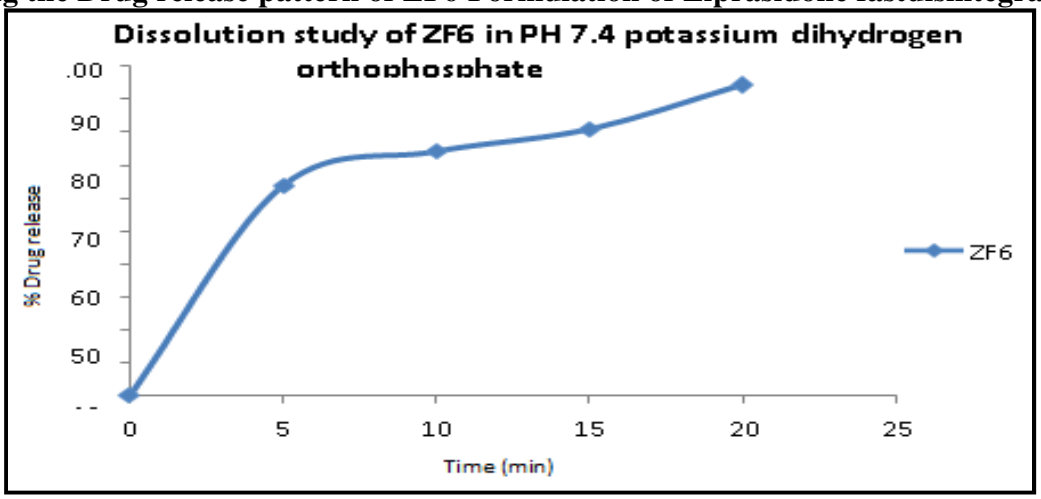


Figure No.9: Graph Showing the Drug release pattern of ZF6 Formulation

Graph Showing the Drug release pattern of ZFC7 Formulation of Ziprasidone fast disintegrating tablets

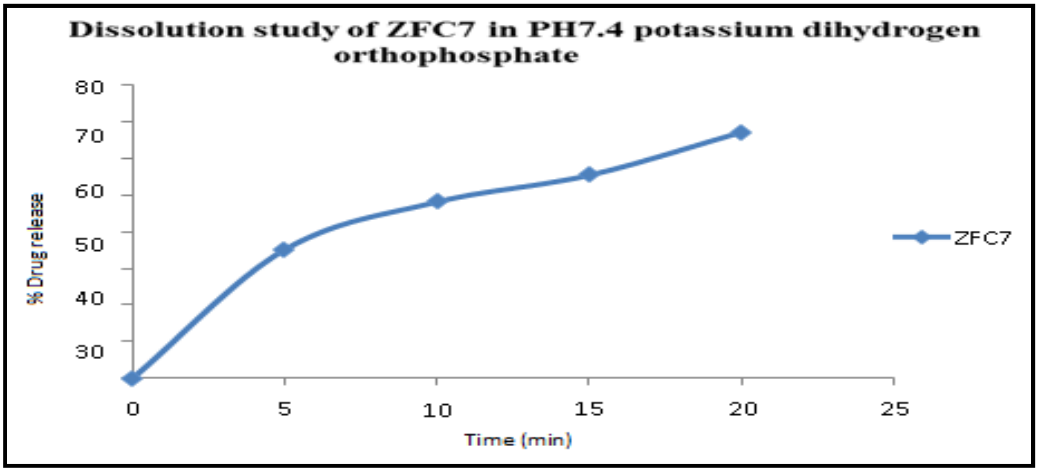


Figure No.10: Graph Showing the Drug release pattern of ZFC7 Formulation

First order release profile of ZF1, ZF2 Formulations

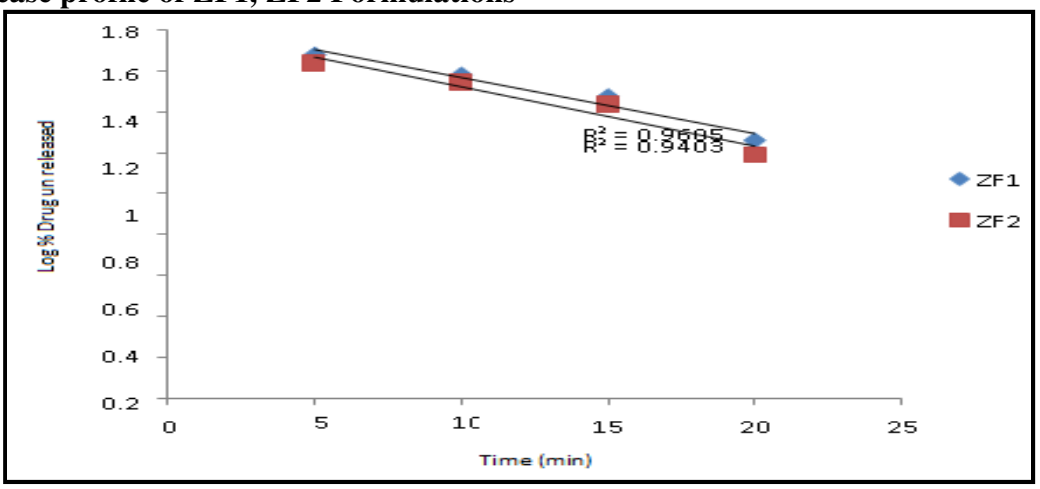


Figure No.11: Graph Showing the Drug release pattern of ZF1, ZF2 formulations

First order release profile of ZF4, ZF5 Formulations

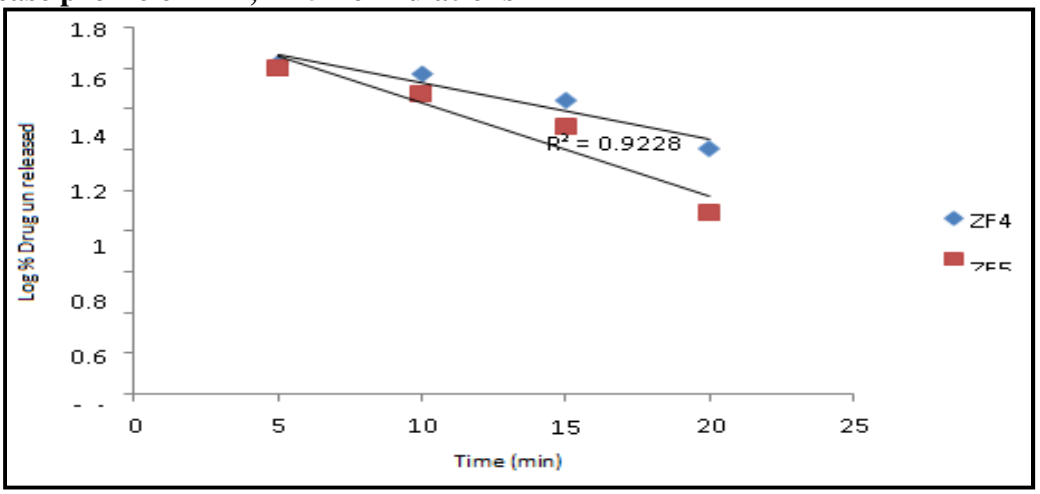


Figure No.12: Graph Showing the Drug release pattern of ZF4, ZF5 formulations

First order release profile of ZF3, ZF6 Formulations

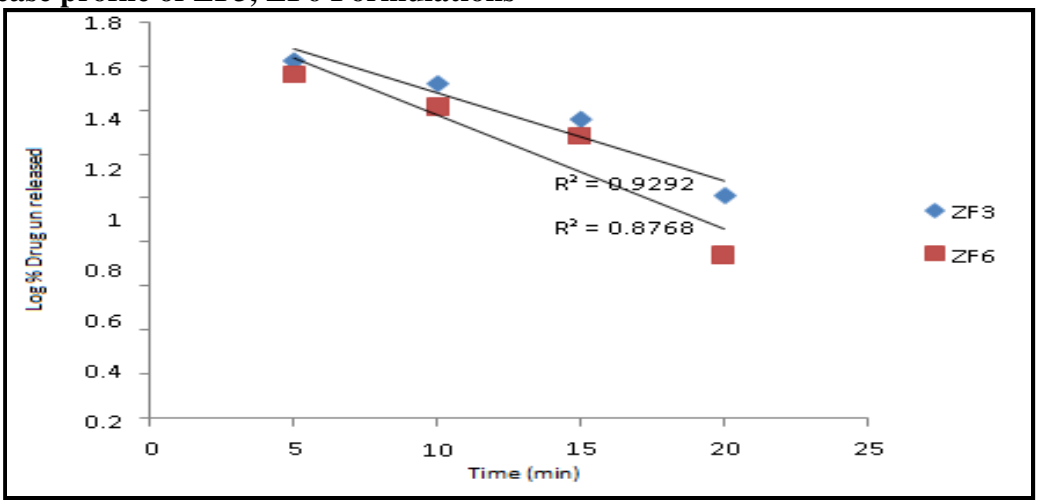
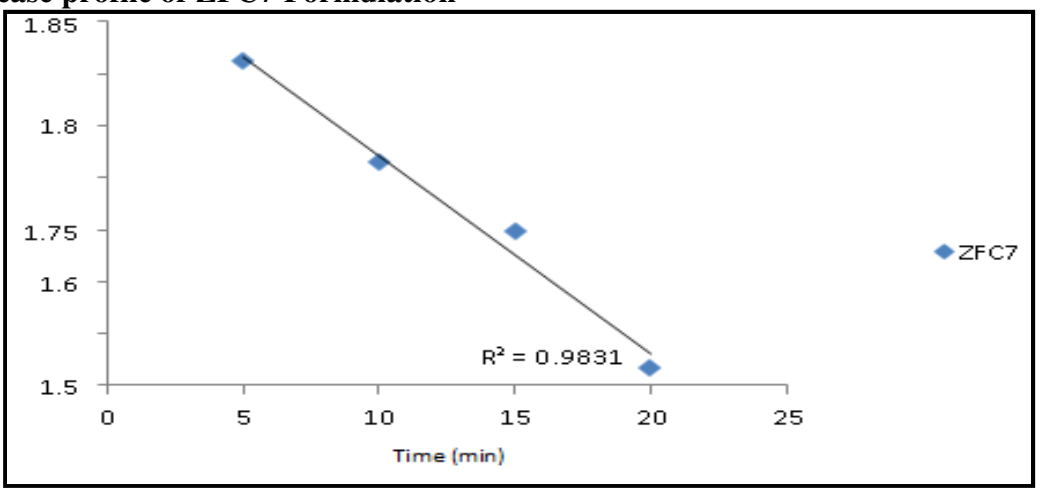


Figure No.13: Graph Showing the Drug release pattern of ZF3, ZF6 formulations

First order release profile of ZFC7 Formulation



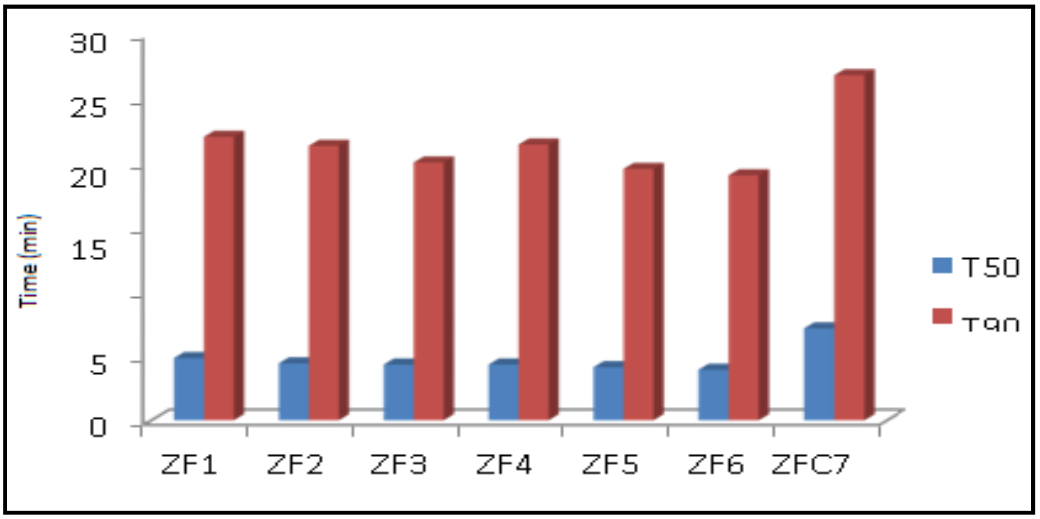
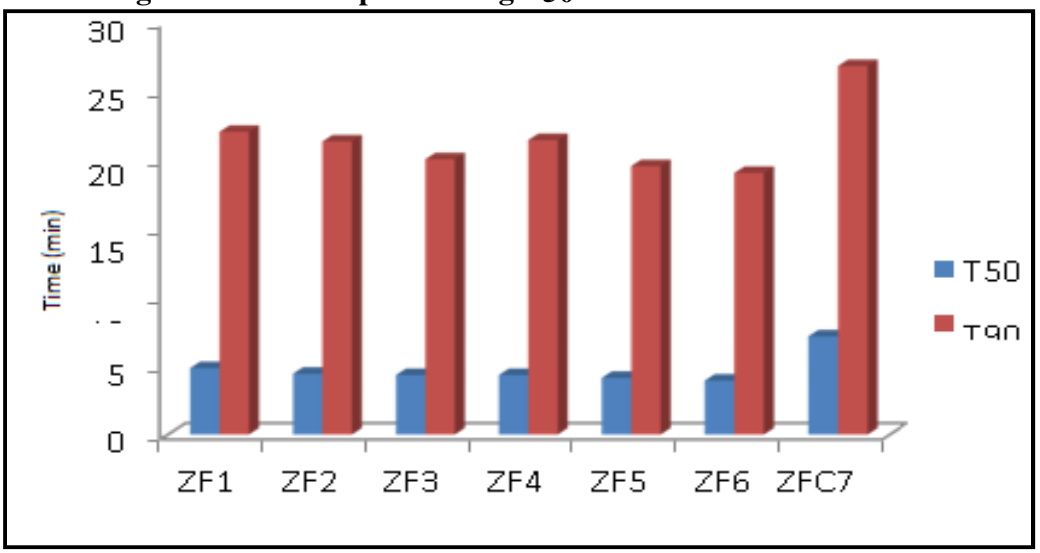


Figure No.14: Graph showing T_{50} values of all formulations



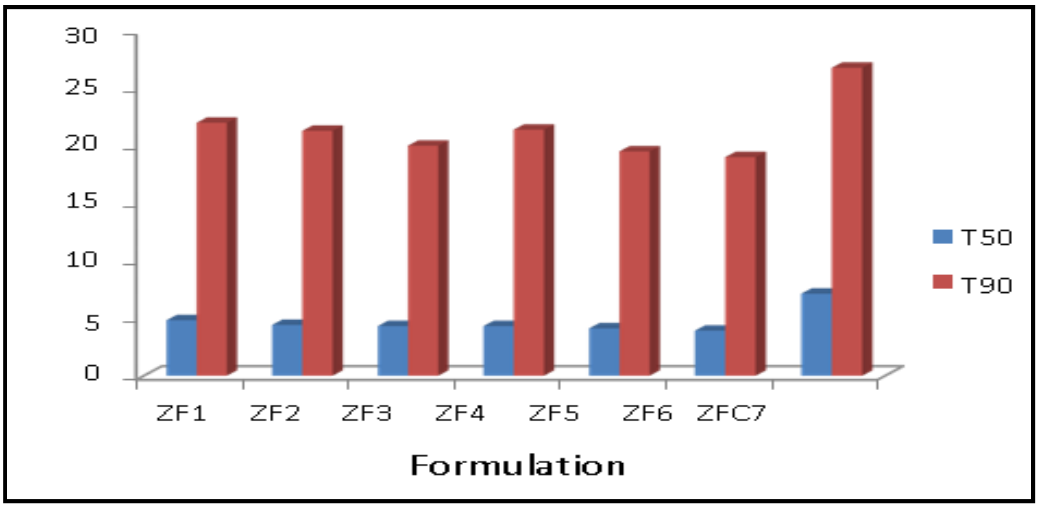


Figure No.15: Graph showing T_{50} values of all formulations

CONCLUSION

The Preformulation studies were done for the raw materials and from the results the flow property of the raw materials were found to be passable. The polymers used in the formulations were in the specified concentration range. The polymer drug interaction studies also done and there is a minimal interaction between the drug and polymers was found.

The micrometrical studies for the powder were carried out and the results show that, the flow property of formulations ZF1 to ZF7 were passable.

The hardness, weight variation, of the tablets was evaluated and all the formulations were compiled within the pharmacopoeial limits.

The friability test was carried out and was found that all of the formulations were compiled within the pharmacopoeial limits.

The dissolution studies were carried out for the formulations ZF1 to ZF7 from the results, the formulations ZF1, ZF2 and ZF3 are formulated by using sodium starch glycolate as super disintegrating agent with polymer concentration 2%, 4%, 6% shows percentage drug release 81.7%, 84.3%, 89.7% respectively, the formulations ZF4, ZF5 and ZF6 are formulated by using croscaramellose sodium as super disintegrating agent with polymer concentration 2%, 4%, 6% shows percentage drug release 83.9%, 92.3%, 94.5% respectively at 20 min. The ZFC7 formulation without any super disintegrant shows 67.1% drug release at 20 min. The drug profile of ZF6 with 6% croscaramellose sodium as super disintegrating agent shows the good percentage drug release and it shows maximum percentage drug release at 20 min 94.5%.

The super disintegrating agents like croscaramellose sodium and sodium starch glycolate fastens the release of ziprasidone from the tablet.

The higher concentration of the polymer (super disintegrant) used, the greater the fastness of the drug release.

Finally we concluded that the ZF6 polymer with higher polymer concentration (6%) shows good drug release on Ziprasidone tablet formulation and can be used for successful development of super disintegrating tablets.

ACKNOWLEDGEMENT

The authors wish to express their sincere gratitude to Department of Pharmaceutics, Vishwa Bharathi College of Pharmaceutical Sciences, Perecherla, Guntur, Andhra Pradesh, India for providing necessary facilities to carry out this research work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Herbert A Liberman, Leon Lachman and Joseph B Schwartz. Tablets in pharmaceutical dosage forms, *New Delhi,* II, 2nd Edition, 2005, 201 -339.
2. Aulton M E. Tablets in the science of dosage form design, *Churchill Livingstone, New Delhi,* 2nd Edition, 397-460.
3. Allen Lv, Wang B. Process for making a particulate support matrix for making rapidly dissolving tablets, *US patent No:5587180,* 1996.
4. Biradar S S, Bhagavati S T, Kuppasad I J. Fast dissolving drug delivery system: A brief over view, *Int J Pharm,* 4(2), 2006, 62-68.
5. Lachman L, Liberman H A, Kiang J L. The theory and practice of industrial Pharmacy, *Varghese Publishing House, Bombay,* 3rd Edition, 1998, 430-440.
6. Kuchekar B S, Badhan D C, Mahajan H S. Mouth dissolving tablets: A Novel drug delivery systems, *Pharma Times,* 35, 2003, 7-9.
7. Reddy C H, Ghose B, Rajneesh A, Chowdary K L. A brief review on fast dissolving drug delivery systems, *Int J Pharm Sci,* 64(4), 2002, 331-336.
8. Ghosh T K, Chatterjee D J, pfister W R. Quick dissolving oral dosage forms; Scientific and regulatory considerations from clinical pharmacology and Biopharmaceutics perspective, *Drug Delivery to the Oral Cavity,* 1st Edition, 2005, 337-356.
9. Aurora J, Pathak V, Chandra R K. Oral disintegrating technologies; An over view, *Drug Delivery Technol,* 5(3), 2003, 50-54.
10. Hamilton E L. Luts Em, Watson B R. Advanced orally disintegrating tablets bring significant benefits to patients and product life cycle, *Drug Delivery Technology,* 5(1), 2005, 34-37.
11. Seager H. Drug delivery products and Zydis fast dissolving dosage form, *J Pharm Pharmacol,* 50(4), 1998, 375-82.
12. Dewalkar Hrushikesh, Hari Prasanna, Kulakarni Upendra, Basawaraj S Patil. Design and development of fast disintegrating tablets containing Ziprasidone by direct compression method, *IJRAP,* 3(2), 2012, 245-249.
13. Rajeshree Panigrahi, Chowdary K A, Gitanjali Mishra, Manas Bhowmik, Saiprasanna. Behera. Formulation of fast dissolving tablets of Lisinopril using combination of synthetic superdisintegrants, *Asian J. Pharm. Tech,* 2(3), 2012, 94-98.
14. Hariprasanna R C, Upendra Kulkarni, Basawaraj S Patil, Vipul Karkar and Parikh Bhavik. Formulation and development of fast disintegrating Felodipine tablets: Functionality of superdisintegrants, *IJPSR,* 1(8), 2010, 93-99.
15. Naik Prajakta Satish, Kurup Nalini Satish. Design and optimization of fast disintegrating tablets containing Metoprolol by sublimation method, *IRJP,* 1(1), 2010, 346-357.
16. Naveen chakravarthi B, Narasimha Rao N, Srinivasa Babu P. Design and development of Levofloxacin hemihydrate fast dissolving tablets using fenugreek powder, *IJABPT,* 3(4), 2012, 87-95.

Please cite this article in press as: Ramya G *et al.* Formulation development and *in-vitro* evaluation of fast disintegrating tablets of ziprosidone by using different disintegrating agents, *Asian Journal of Phytomedicine and Clinical Research,* 9(3), 2021, 144-155.