



## International Journal of Innovative Pharmaceutical Research

Journal homepage: [www.ijipr.com](http://www.ijipr.com)

### Formulation and Evaluation of Fenofibrate Tablets Using Different Binding Agents

PamulaReddy Bhavanam<sup>1\*</sup>, K.V.Subhaskar Reddy<sup>1</sup>, V.Ravikanth<sup>1</sup>, G.Surender<sup>1</sup>, D.Savithri<sup>1</sup>, Bharat Valluri<sup>2</sup>, Bharat Kumar Varma<sup>3</sup> and P.Dinakar<sup>4</sup>

<sup>1\*</sup>Vishnu Institute of Pharmaceutical Education and Research Vishnupur, Narsapur, Medak (Dist), Andhra Pradesh, India-522005.

<sup>2</sup>Department of Formulation R&D, Granules India Limited, Hyderabad. India

<sup>3</sup>JSS College of Pharmacy, Mysore, India.

<sup>4</sup>Department of Pharmacy, VIT, Vellore, Tamilnadu, India

#### ABSTRACT

Fenofibrate is a drug of the fibrate class. It is mainly used to reduce cholesterol levels in patients at risk of cardiovascular disease. Like other fibrates, it reduces both low-density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels, as well as increasing high-density lipoprotein (HDL) levels and reducing triglycerides level. In this study, fenofibrate 160mg tablets were prepared by wet granulation method using sodium lauryl sulfate (SLS) and Povidone k-30 as a binding agents with different concentrations and evaluated for uniformity of weight, friability, hardness, thickness, disintegration and dissolution. The formulations were coded as Fenol Fenol2 and Fenol3. Among these formulations Fenol1 has shown the better dissolution release than Fenol2 and Fenol3.

**Key Words:** Fenofibrate, Wet granulation, Dissolution Rate.

#### INTRODUCTION

Fenofibrate is a drug of the fibrate class. It is mainly used to reduce cholesterol levels in patients at risk of cardiovascular disease. Like other fibrates, it reduces both low-density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels, as well as increasing high-density lipoprotein (HDL) levels and reducing triglycerides level. It also appears to have a beneficial effect on the insulin resistance featured by the metabolic syndrome (Wysocki J *et al.*, 2004). Fenofibrate increases the serum level of statins. Therefore, a lower dose of statin is generally necessary. Dose of fenofibrate must also be lowered in moderate to severe renal failure and most experts recommend that fenofibrate be given in the morning and the statin at night.

**\*Corresponding author**

**PamulaReddy Bhavanam**

**Email id: [pamula1983@rediffmail.com](mailto:pamula1983@rediffmail.com)**

Fenofibrate is a fibric acid derivative whose lipid modifying effects reported in humans are mediated via activation of Peroxisome Proliferator Activated Receptor type alpha (PPAR $\alpha$ ). Through activation of PPAR $\alpha$  fenofibrate increases the lipolysis and elimination of atherogenic triglyceride-rich particles from plasma by activating lipoprotein lipase and reducing production of apoprotein CIII. Activation of PPAR $\alpha$  also induces an increase in the synthesis of apoproteins AI and AII, which leads to a reduction in very low - and low density fractions (VLDL and LDL) containing apoprotein B and an increase in the high density lipoprotein fraction (HDL) containing apoprotein AI and AII. In addition, through modulation of the synthesis and catabolism of VLDL fractions, fenofibrate increases the LDL clearance and reduces small and dense LDL, the levels of which are elevated in the atherogenic lipoprotein phenotype, a common disorder in patients at risk for coronary heart disease (Fournier SA, 2003). Three randomized, double-blind, multicenter, phase III trials have shown that treatment with fenofibric acid plus a statin

(atorvastatin, rosuvastatin or simvastatin) improved HDL and triglyceride levels significantly better than statin

In the FIELD study, it also shows the benefit of reducing the risk of microvascular complications in type 2 diabetes patients. Fenofibrate treatment led to reduction in the progression albuminuria (14% less progression and 15% more regression compared with placebo). In addition, there is a 30% reduction of the needs for laser treatment for retinopathy (FIELD study investigators, 2005). The FIELD sub-analysis study shows that fenofibrate reduces the first laser treatment by 31%. In addition, for macular oedema by 31% and for proliferative retinopathy by 30% (FIELD study investigators, 2007). In the ophthalmology sub-study, fenofibrate reduces the development or progression of retinopathy by reducing 22% in all patients and 79% in patients with pre-existing retinopathy (FIELD study investigators, 2007). The FIELD study also showed that fenofibrate reduced the number of non-traumatic amputations by 38% (Burgess D *et al.*, 2007). The highest risk and greatest benefits of fenofibrate are seen among those with marked hyper triglyceridemia (Russell Scott *et al.*, 2009). Fenofibrate has a uricosuric effect, making it of use in the management of gout (Bardin T, 2009).

#### MATERIALS AND METHODS

Fenofibrate was gifted from MSN Laboratories Limited, Hyderabad. Cross Povidone, Povidone k-30 was purchased from Vijaya scientifics, Hyderabad. Lactose monohydrate, SLS was purchased from Yarrow Chemicals Pvt ltd, Mumbai.

#### Preparation of Fenofibrate Tablets

Tablets were prepared by wet granulation method. Dissolve the required quantities of SLS, Povidone k-30 in water and used as a binder solution. Add binder solution to mix containing drug, LMH, MCC (PH-101), and CP. The wet granules obtained from granular mass were passed through Sieve No.10 and resultant granules were dried in hot air oven at 50°C. The dried granules were sifted through Sieve No.20 followed by lubrication with magnesium Stearate and anhydrous lactose. Lubricated granules were compressed using single punch TABLET machine.

#### Uniformity of weight

monotherapy, improved LDL levels better than fenofibric acid monotherapy (Yang L *et al.*, 2009).

The test was carried out on 20 tablets as per the specifications in I.P. Average weight and maximum percentage deviation was determined.

#### Hardness Test

The hardness test was conducted on five tablets using Monsanto hardness tester. The average value was determined.

#### Friability Test

This test was performed on 20 tablet using Roche friabilator. The tablets were weighed and kept in the friabilator, after 100 revolutions, the tablets were dedusted and weighed. Percent loss in weight was determined.

#### Dissolution Studies

The release rate of Fenofibrate tablets was studied using USP II (paddle Type) dissolution test apparatus. The quantity of dissolution medium was 900 ml of 0.05M SLS, with the speed of rotation at 75 rpm and the temperature was set at 37±0.5°C. The samples were withdrawn at different time intervals. The withdrawn samples were suitably diluted and analysed in UV spectrophotometer at 245 nm.

#### RESULTS AND DISCUSSION

Fenofibrate tablets were prepared using different concentrations of varying binding agents and subjected for *in vitro* drug release studies. The Varying concentrations of the binding agents (SLS and Povidone K-30) are utilized in the formulations of Feno1, Feno2 and Feno3.

Feno1 shows the better disintegration time than feno2 and feno3. It may be due to the increased concentrations of binding agents in feno2 and feno3. The disintegration time for Feno1 is 3mins, feno2 is 4mins and feno3 is 6mins.

The effects of the different concentrations of binding agents (SLS and Povidone k-30) on the dissolution behavior of tablets were investigated. The drug release from fenofibrate tablets containing high concentrations of binding agents was extremely slow. Amongst the formulations prepared feno1 shows the better drug release (98%) compared to that of feno2 (85%) and feno3 (80%) at the end of 1 hour. The tablets prepared from low concentrations of SLS and Povidone k-30 shown the excellent dissolution behavior.

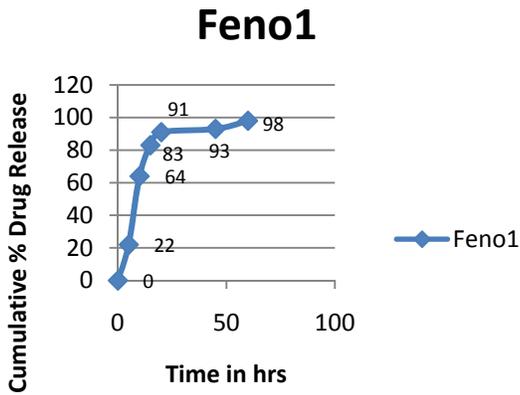
**Table.1 Composition of Fenofibrate Oral Formulations**

S.No.	INGREDIENTS	Feno1(mg/tab)	Feno2(mg/tab)	Feno3(mg/tab)
1	Fenofibrate	160	160	160
2	Lactose monohydrate	60	56	50
3	MCC(PH-101)	20	16	10
4	Cross povidone	14	9	11
5	SLS	5	10	15
6	Povidone k-30	8	16	21
7	Purified water	Q.S.	Q.S.	Q.S.
8	Magnesium Stearate	3	3	3

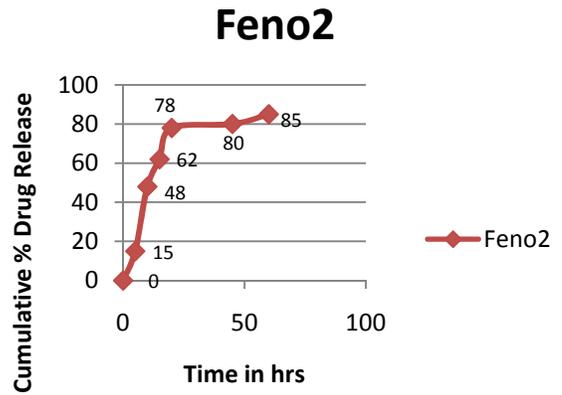
**Table.2 Disintegration profile for Fenofibrate oral formulation**

S.NO.	Formulation Code	Disintegration time (mins)
1	Feno1	3
2	Feno2	4
3	Feno3	6

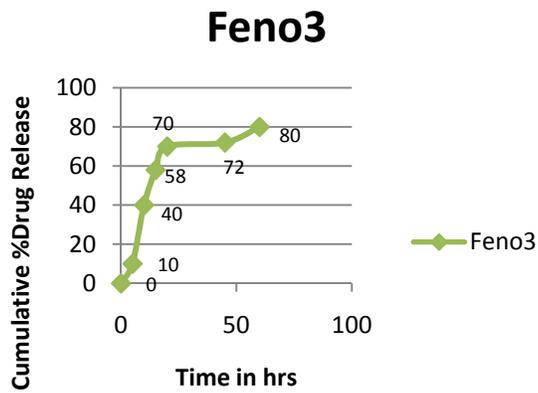
**Fig.1** *In-vitro* dissolution studies of Feno1 formulation with SLS and Povidone k-30



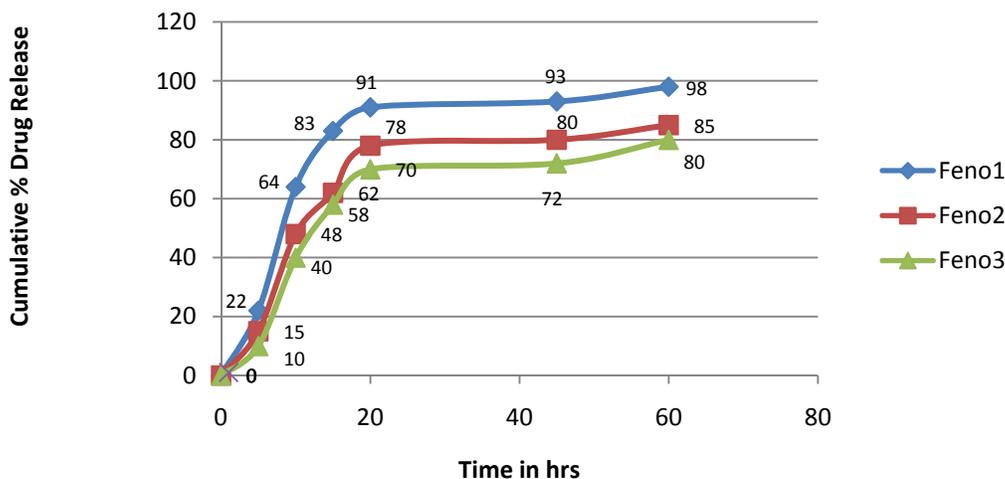
**Fig.2** *In-vitro* dissolution studies of Feno2 formulation with SLS and Povidone k-30



**Fig.3** *In-vitro* dissolution studies of Feno3 formulations with SLS and Povidone k-30



**Fig.4** *In-vitro* dissolution studies of three formulations with SLS and Povidone k-30



**Conclusion**

Fenofibrate tablets containing different concentrations of varying binding agents (SLS and Povidone k-30) were prepared by wet granulation method and subjected to *in vitro* drug release studies. From the present research work, it can be concluded that the formulation of fenofibrate tablets using low concentrations of SLS and Povidone k-30 showed the better drug release (Feno1) in comparison with the other formulations feno2 and feno3. The Feno1 release pattern was found be 98% in 60mins, Feno2 was found be 85% in 60mins and Feno3 was found to be 80% in 60mins. *In-vitro* dissolution studies showed the better release of drug for

Feno1. The Feno1 tablets containing SLS (3.1%) and Povidone k-30 (5%) at low concentrations were suitable for the formulation of fenofibrate 160mg tablets.

**Acknowledgements**

The authors are thankful to our chairman Sri K V VISHNU RAJU for supporting us in every aspect to develop the Research work. The authors are also grateful to Dr. V.H.K. VERMA, principal and staff Vishnu Institute of Pharmaceutical Education & Research, Narsapur, Medak, Andhra Pradesh. They are also thankful to MSN laboratories Ltd, Hyderabad for providing free gift sample.

**References**

Burgess D, et al., on behalf of the field investigators. Effect of fenofibrate on silent myocardial infarction, hospitalization for acute coronary syndromes and amputation in type 2 diabetes: the FIELD study. *Circulation* 2007;116: II\_838 [abstract].  
 Bardin T, "Fenofibrate and losartan". *Ann. Rheum. Dis.* 2003;62(6):497-8.  
 FIELD study investigators. "Effects of long-term fenofibrate therapy on cardiovascular events in 9795 people with type 2 diabetes mellitus (the FIELD study). A randomised controlled trial". *Lancet*, 2005;366(9500):1849-61.  
 FIELD study investigators. Effect of fenofibrate on the need for laser treatment for diabetic retinopathy (FIELD Study). A randomised controlled trial. *Lancet*, 2007;370:1687-97.  
 FIELD study investigators. Effect of fenofibrate on the need for laser treatment for diabetic retinopathy (FIELD Study). A randomised controlled trial. *Lancet*, 2007;370:1687-97.  
 FIELD study. *Circulation* 2007;116:II\_838 [abstract].  
 Package Insert: Laboratories Fournier SA, (September 2003).  
 Russell Scott, et al., On behalf of the field investigators. Effects of fenofibrate treatment on cardiovascular disease risk in 9,795 individuals with type 2 diabetes and various components of the metabolic syndrome: the Field study. *Diabetes Care*, 2009;32:493-498.  
 Wysocki J, Belowski D, Kalina M, Kochanski L, Okopien B, Kalina Z. "Effects of micronized fenofibrate on insulin resistance in patients with metabolic syndrome". *Int J ClinPharmacolTher.*, 2004;42(4):212-7.  
 Yang L, Keating GM. Fenofibric Acid: In Combination therapy in the Treatment of Mixed Dyslipidemia. *American Journal of Cardiovascular Drugs*, 2009;9(6):401-409.