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FORMULATION AND EVALUATION OF FAST DISSOLVING TABLETS OF NIFEDIPINE

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Abstract

In the present study, there was an attempt to make fast dissolving tablets using the direct dissolution method containing Nifedipine-Manitol solid dispersion. The main objective of the work was to prepare Nifedipine solid dispersion with Manitol to initiate action. The solid dispersion was prepared by the solvent evaporation method and evaluated for cumulative drug release. FDT was formulated by direct compression method using different superdisintegrants such as, CCS and SSG in different range (1-3%). Preformulation studies were performed on the powder mixture for tablets. The flow properties (F1-F18) of the mixture were evaluated by the determining of Carr's index, Hausner ratio and angle of repose. The formulated tablets were evaluated for thickness, hardness, friability, weight variation, wetting time, drug content uniformity, disintegration time and In-vitro dissolution studies. Thus it was concluded that FDT with Nifedipine-Manitol solid dispersion with reduced dissolution time can be prepared by direct compressing method, using co-processed mixture of Cross Carmellose Sodium and Sodium Starch Glycolate in the ratio1% and 2% prepares as superdisintegrants respectively.

Keywords- Nifedipine, Fast dissolving tablet, IR and UV

Introduction

The delivery of oral drug has been known for decades as the most widely used route of administration among all the routes that have been traced to systemic delivery of drugs through various pharmaceutical products of different dosage forms.[1]

Solid dosage forms are popular due to ease of administration, precise dosage, self-medication, pain relief, and most importantly patient compliance. The most popular solid dosage forms are pills and capsules. An important drawback of these dosage forms for some patients however is difficulty in swallowing.[2]

Recent development of technology has presented viable dosage options for patients who may have difficulty swallowing tablets or capsules. Conventional tablets and capsules administered with water may be inconvenient or impractical for other patients. In such situations rapidly disintegrating/dissolving tablets which can be administered without water. Such fast dissolving/disintegrating tablets are required which can be administered without water. Such rapid dissolving tablets (FDT) spread rapidly after mixing in saliva to form a suspension or solution of the drug that is easily swallowed by the patients.[3]

The target population for these new rapidly dissolving dosage forms has been typically pediatric, geriatric & bedridden or developmentally disabled patients. Persistent nausea patients who are travelling or who have little or no access to water are also good candidates for rapidly dissolving tablets. Pharmaceutical marketing is another reason for the increase in available rapidly dissolving/disintegrating products[6]. The major advantage of FDT is that it combines the advantages of both liquid and conventional tablet formulations, while both offer advantages over traditional dosage forms.[7]

Some FDTs also claim an increased bioavailability compared to traditional tablets because of dispersion in saliva resulting in pregastric absorption[8]. Fast dissolving drug delivery system have started gaining popularity and acceptance as new delivery system, because they are easy to administer and lead to better patient compliance. However, for the elderly and infants, conventional tablets present certain difficulties while consuming, usually elderly patients experience difficulty in swallowing the conventional dosage forms (tablets, capsules, solutions and suspensions) because of tremors of extremities, dysphagia and extra pyramidal disorders like Parkinsonism etc. In such cases, preference would be given to liquid dosage forms which also have its own disadvantages. FDTs have the added advantages of both solid and liquid dosage forms. Moreover it is the best way of administration of the medicament to the patient who is mentally ill, disabled and un cooperative. Sizeable section of the pharmaceutical research is focused on the development of these fast dissolving delivery systems.[9]

IDEAL CHARECERISTICS OF FDTs

- They should not require water or other liquid at the time of administration.
- They should easily disintegrate or dissolve in oral cavity.
- They should allow high drug loading.
- They should have pleasant mouth feel.
- They should haven eligible or no residue in the oral cavity after administration as whole drug passes to GIT.
- They should show low sensitivity against environmental conditions i.e. moisture, temperature etc.

SIGNIFICANCE/ADVANTAGES OF FDT

FDTs offer all advantages of solid dosage forms and liquid dosage forms along with special advantages, which include:

- No risk of obstruction of dosage form, which is beneficial for travelling patients who do not have access to water.
- Easy to administer for paediatric, geriatric and institutionalized patients (especially for mentally retarded and psychiatric patients).
- Rapid disintegration of tablet resulting in quick dissolution and rapid absorption, which provides rapid onset of action.
- Excellent mouths feel property produced by use of flavours and sweeteners which has changed the concept of medication as “Bitter pill”.
- Increased bioavailability of drugs that are absorbed from mouth, pharynx and oesophagus.
- Reduced dose and increase in bioavailability due to pregastric absorption of drugs which avoid hepatic metabolism.[4]

2. METHODOLOGY

Table 1: Drug/Excipients/Solvents Source

Drug / Excipient /Solvent	Source
Nifedipine	Rydberg Pharmaceuticals Private Limited, Dehradun
Manitol	Evonik Degussa India Private Limited, Mumbai
Sodium starch Glycolate	International Specialty Product, Hong Kong Ltd.
Sodium Starch Glycolate	JRS Pharma, Rosenberg (Germany).
Croscarmellose Sodium	The Anglo French Drug Co. Limited, Bangalore.
Microcrystalline Cellulose	The Anglo French Drug Co. Limited, Bangalore
Lactose	S.D. Fine Chemicals Limited
Magnesium stearate	S.D. Fine Chemicals Limited
Methanol	S.D. Fine Chemicals Limited
Ethanol	S.D. Fine Chemicals Limited
Petroleum ether	S.D. Fine Chemicals Limited

Table 2: LIST OF EQUIPMENTS AND INSTRUMENTS

Equipments/Instruments	Manufacturer
Analytical balance	Shimadzu BL220H, Japan
UV visible	SHIMADZU UV-1700 PC, Shimadzu, Corporation, Japan.
FT-IR spectrophotometer	Jasco 460 plus FT-IR spectrophotometer
Digital pH meter	Digisun electronics, Hyderabad
FT-IRspectrophotometer	Jasco 460 plus FT-IR spectrophotometer
Digital vernier caliper	Baker gauzes India ltd.

UV SPECTROPHOTOMETRIC METHOD FOR NIFEDIPINE:

Principle:

Nifedipine is reported to exhibit λ_{max} at238 nm

Procedure:

20 mg of Nifedipine was accurately weighed and dissolved in 20ml of Methanol and the volume was made up to 100 ml with Phosphate Buffer pH 7.4 to get a stock solution of 1 mg/ml. Further, an aliquot was pipetted out and diluted suitably to get the concentration in the Beer's range and was scanned in the wavelength region of 200-400 nm to record the wavelength of maximum absorption (λ_{max})..

Preparation of standard solution:

20 mg of Nifedipine was accurately weighed and dissolved in 20ml of Methanol and the volume was made up to 100 ml with Phosphate Buffer pH 7.4 to get a stock solution of 1 mg/ml.

Preparation of working standard solution:

Working standard solutions having concentrations 2 to 10 µg/ml were prepared by appropriately diluting the stock solution. The absorbance of the working standard solution was recorded and a graph of concentration of the solution was plotted against absorbance using Microsoft Excel software.

DRUG EXCIPIENTS INTERACTION STUDY:

1. **Solubility Study of Nifedipine in various Solvents**

Solubility studies were carried out at room temperature, in triplicate according to method reported by Higuchi and Connors.[59] Excess amount of nifedipine was added various solvents in a series of stoppered conical flasks and shaken for 48 hr. on a rotary flask shaker. The suspensions were filtered through whattman filter paper and as stayed for nifedipine using UV spectrophotometer at 237.5 nm against blank prepared using same concentration of the various carriers in phosphate Buffer pH 7.4 The solubility of Nifedipine in various solvents is calculated.

2. Solubility Study of Nifedipine in various Carriers

Solubility studies of nifedipine in various carrier solutions were carried out at room temperature, in triplicate according to method reported by Higuchi and Connors.[23] Excess amount of nifedipine was added to Phosphate Buffer pH 7.4 containing various concentrations of Mannitol, PVPK30, PEG4000, PEG6000, PEG8000 and Urea in a series of stoppered conical flasks and shaken for 48hr. on a rotary flask shaker. The suspensions were filtered through whattman filter paper and as sayed for nifedipine using UV spectrophotometer at 237.5 nm against blank prepared using same concentration of the various carriers in phosphate Buffer Ph 7.4.The infrared spectra of Nifedipine, Mannitol and Nifedipine along with various tablet excipients were recorded using a FTIR spectrophotometer. The IR spectra's of solid dispersion were compared with that of Nifedipine to check for any possible drug-excipient interaction.

PREPARATION OF SOLID DISPERSION:

The Nifedipine-Mannitol solid dispersions were prepared by Solvent evaporation method. In this method, solid dispersions of Nifedipine were prepared by solvent evaporation method. The physical mixture of Nifedipine and other carriers (of Mannitol, PVPK30, PEG 4000, PEG6000, PEG8000 and Urea) was dissolved in sufficient quantity of methanol in a beaker and the solution was kept overnight in a petridish for solvent evaporation. The obtained product was scrapped and powdered. The percentage yield was found to be 85%.

CHARACTERIZATION OF NIFEDIPINE-MANNITOL SOLID DISPERSION:

The drug-Mannitol solid dispersions prepared were characterized by Dissolution studies. *In-vitro* dissolution study of the solid dispersions prepared was performed using USP (Type-II) apparatus at a speed of 50 rpm. Dissolution study was carried out using 900 ml Phosphate buffer pH.4 as dissolution medium maintained at a temperature of 37°C± 5ºC. At appropriate intervals, 1 ml of the solution was taken and dissolution medium was replaced by 1 ml of fresh dissolution fluid to maintain constant volume. The samples were then analyzed at 237.5 nm by UV/visible spectrophotometer using Phosphate buffer pH 7.4 as blank. The mean of three determinations was used to calculate the drug release from each of the solid dispersion.

Table 3(a): Formulation FC,F1-F4

		FC		F1		F2		F3		F4	
S.No.	**Ingredients**	**Q**	**P**	**Q**	**P**	**Q**	**P**	**Q**	**P**	**Q**	**P**
1	Nifedipine-Mannitol Solid Dispersion	50	33	50	33	50	33	50	33	50	33
2	Mannitol	14	9	10	7	10	7	10	7	10	7
3	Lactose	77	51	80	53	79	53	78	52	77	51
4	Magnesium stearate	2	1	2	1	2	1	2	1	2	1
5	Talc	3	2	3	2	3	2	3	2	3	2
6	Sucrose	3	2	3	2	3	2	3	2	3	2
7	Citric acid	1	1	1	1	1	1	1	1	1	1
8	Croscarmellose Sodium	0	0	1	1	2	1	3	2	4	3
9	Sodium Starch	0	0	0	0	0	0	0	0	0	0
10	Sodium Starch Glycolate										

Q: Quantity per tablet (mg) P: Percentage per tablet

Table 3(b): Formulation F5-F8

		F5		F6		F7		F8	
S.No.	**Ingredients**	**Q**	**P**	**Q**	**P**	**Q**	**P**	**Q**	**P**
	Nifedipine-Mannitol Solid Dispersion	50	33	50	33	50	33	50	33
	Mannitol	10	7	10	7	10	7	10	7
	Lactose	80	53	79	53	78	52	77	51
	Magnesium stearate	2	1	2	1	2	1	2	1
	Talc	3	2	3	2	3	2	3	2
	Sucrose	3	2	3	2	3	2	3	2
	Citric acid	1	1	1	1	1	1	1	1
	Croscarmellose Sodium	0	0	0	0	0	0	0	0
	Sodium Starch Glycolate	1	1	2	1	3	2	4	3

Q: Quantity per tablet (mg) P: Percentage per tablet

Table 3(c): Formulation F9-F12

		F9		F10		F11		F12	
S.No.	**Ingredients**	**Q**	**P**	**Q**	**P**	**Q**	**P**	**Q**	**P**
	Nifedipine-Mannitol Solid Dispersion	50	33	50	33	50	33	50	33
	Mannitol	10	7	10	7	10	7	10	7
	Lactose	77	51	77	51	77	51	77	51
	Magnesium stearate	2	1	2	1	2	1	2	1
	Talc	3	2	3	2	3	2	3	2
	Sucrose	3	2	3	2	3	2	3	2
	Citric acid	1	1	1	1	1	1	1	1
	Croscarmellose Sodium	3	2	2	1	1	1	3	2

	Sodium Starch Glycolate	1	1	2	1	3	2	2	1

: Quantity per tablet (mg) P: Percentage per tablet

Table 3(d): Formulation F13-F16

		F9		F10		F11		F12	
S.No.	**Ingredients**	**Q**	**P**	**Q**	**P**	**Q**	**P**	**Q**	**P**
	Nifedipine-Mannitol Solid Dispersion	50	33	50	33	50	33	50	33
	Mannitol	10	7	10	7	10	7	10	7
	Lactose	77	51	77	51	77	51	77	51
	Magnesium stearate	2	1	2	1	2	1	2	1
	Talc	3	2	3	2	3	2	3	2
	Sucrose	3	2	3	2	3	2	3	2
	Citric acid	1	1	1	1	1	1	1	1
	Croscarmellose Sodium	3	2	2	1	1	1	3	2
	Sodium Starch Glycolate	1	1	3	2	3	2	2	1

In-vitro Dissolution Study

Dissolution study was carried out using USP XXII dissolution test apparatus type II. The dissolution medium used was 900 ml of Phosphate buffer pH 7.4(without enzyme) which was maintained at 37^0C. The paddle speed was kept at 50 rpm throughout the study. Two ml of samples was withdrawn at every 10 minutes interval and diluted to 10 ml then 1ml of fresh dissolution media maintained at the same temperature was replaced. The samples were analyzed spectrophotometrically at 237.5 nm using Phosphate buffer pH 7.4(without enzyme) as blank. The raw dissolution data was analyzed for calculating the amount of drug released and percentage cumulative drug released at different time intervals.

For finding out the mechanism of drug release from FDTs, the dissolution data obtained from the experiments were treated with the different release kinetic and mechanism equations.

4. RESULTS

A. UV SPECTUM OF NIFEDIPINE IN PHOSPHATE BUFFER pH7.4

Fig.1. UV Spectrum of Nifedipine in Phosphate Buffer pH7.4

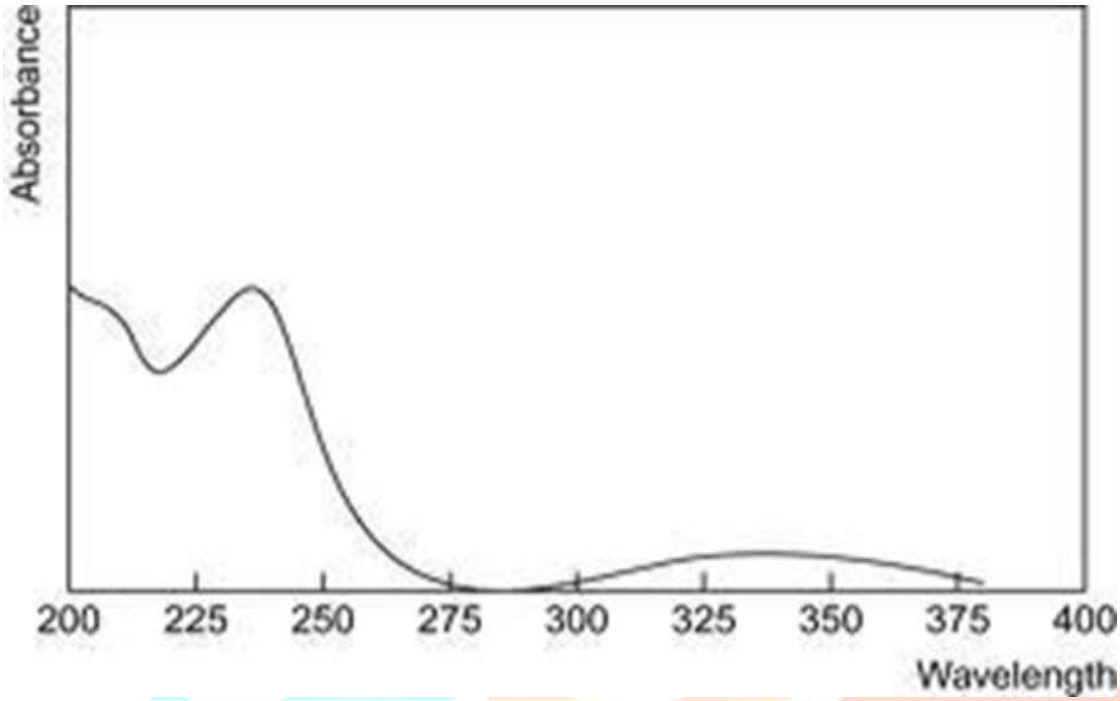
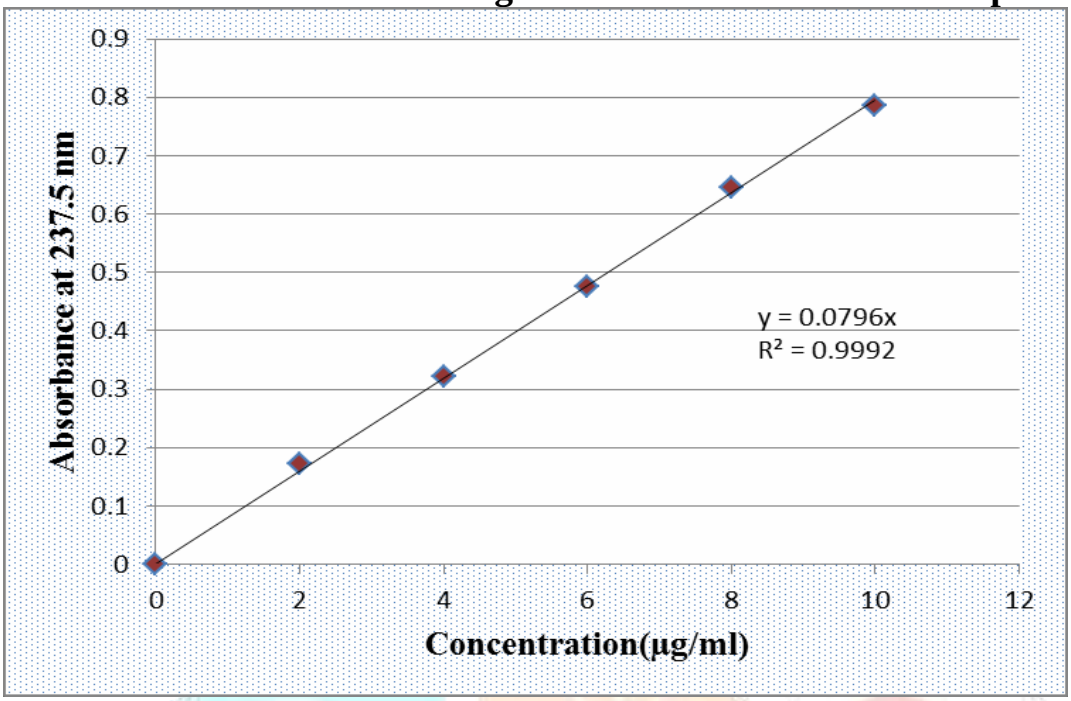


Table 8: Data for calibration curve of Nifedipine in Phosphate Buffer pH 7 (Average of three reading)

Average Weight of Tablets (mg)	Absorbance at 237.5nm*	Standard Deviation
0	0	0
2	0.173	0.003
4	0.322	0.002
6	0.475	0.007
8	0.645	0.013
10	0.787	0.011

Fig.2. Calibration curve of Nifedipine



B. PREFORMULATION STUDIES

1. Drug-Excipient interaction Study using FTIR Spectrophotometer

Fig.4. (a). IR Spectra of Nifedipine:

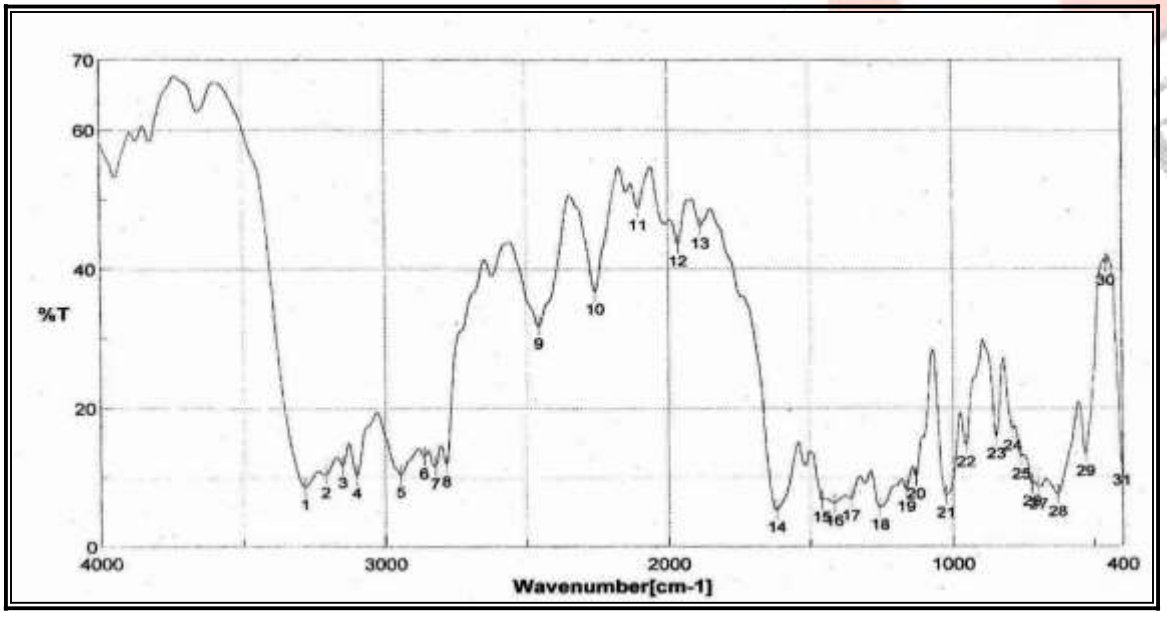


Fig. 4.(b). IR Spectra of Nifedipine with tablet excipients

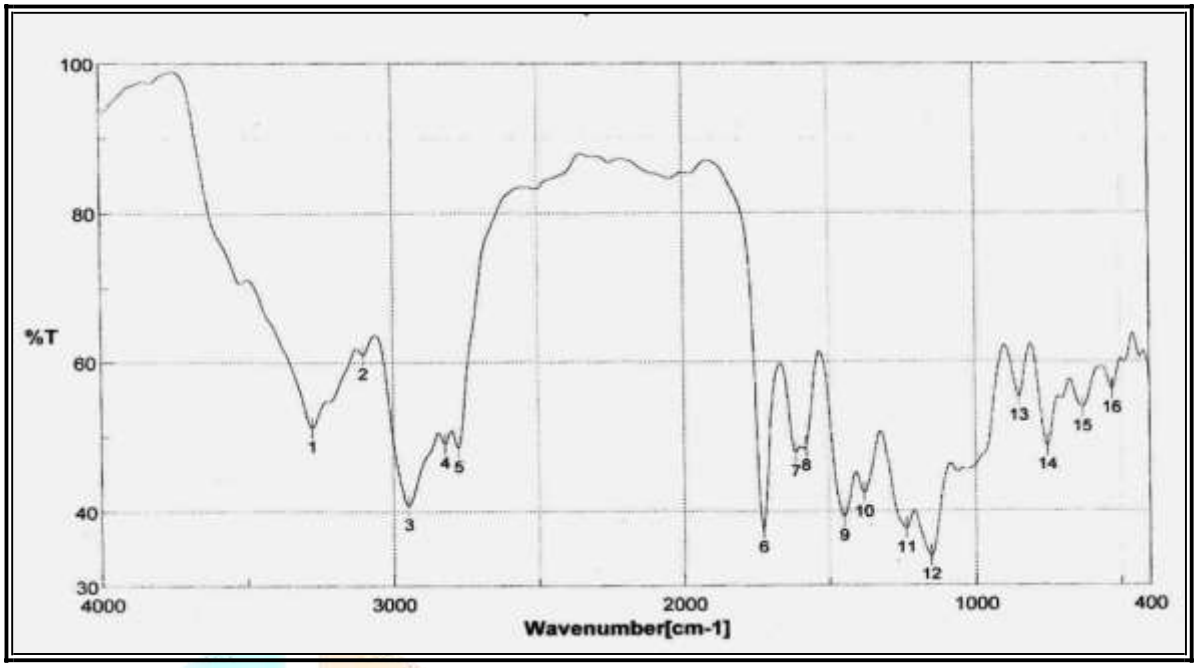


Fig.4. (c) IR Spectra of Mannitol

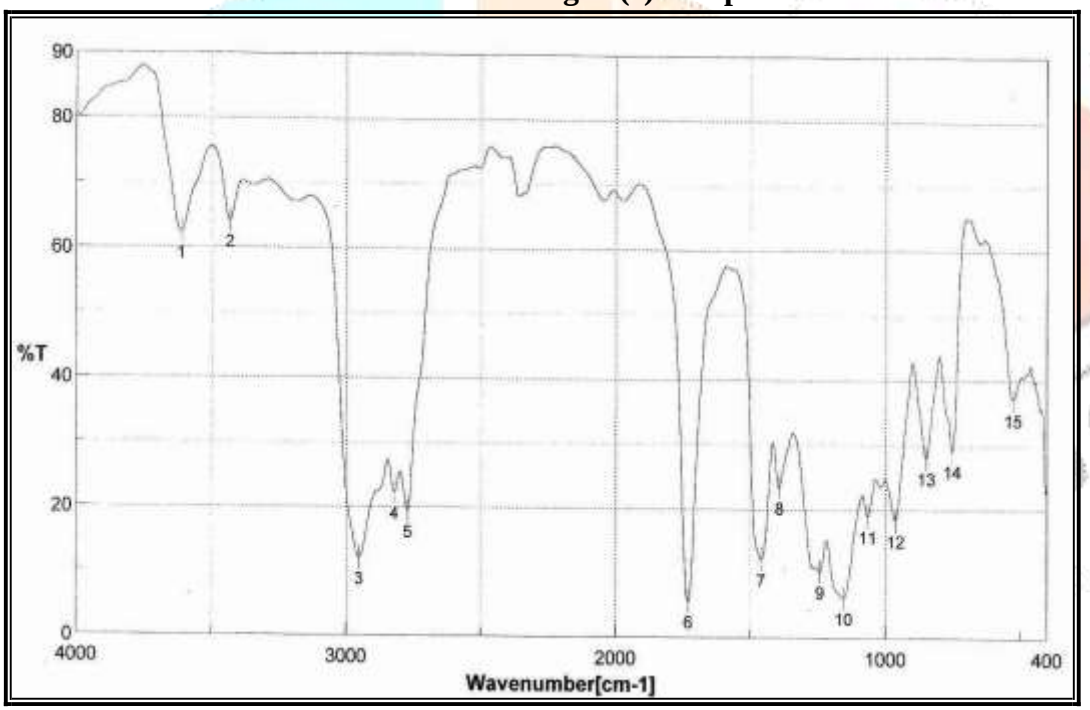
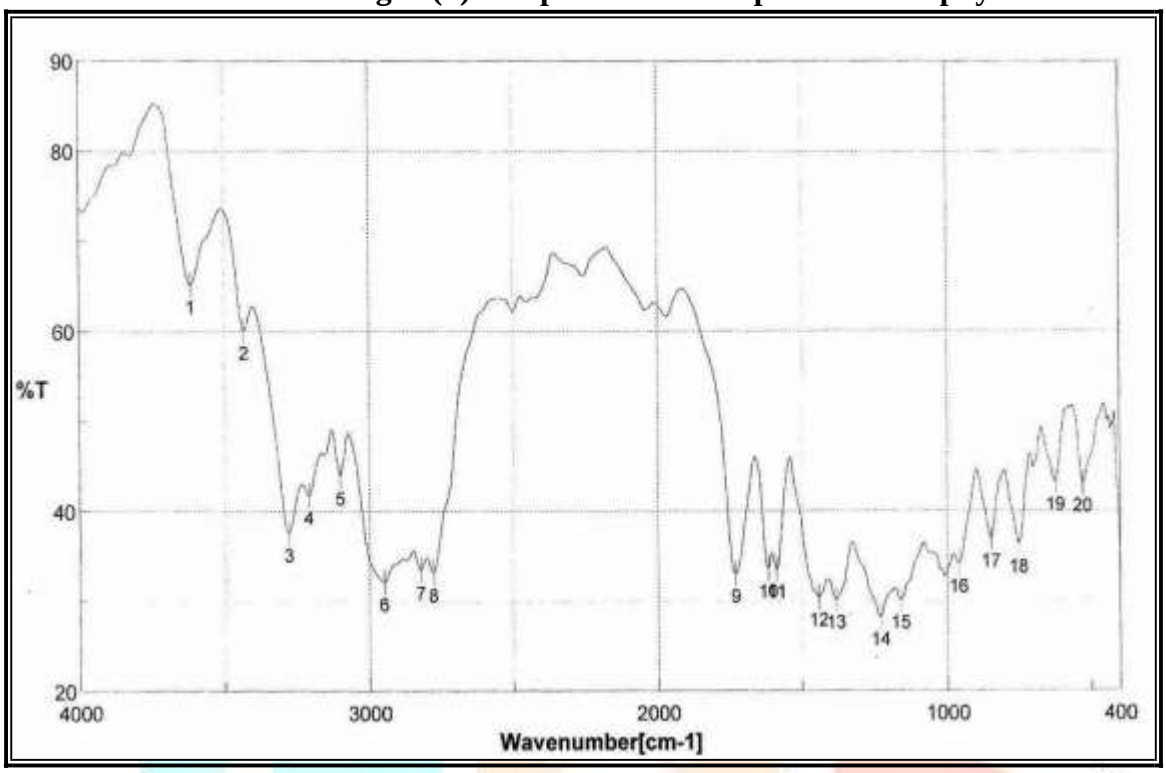


Fig.4. (d).IR Spectra of Nifedipine-Manitol physical mixture



1. DISCUSSION

In the present work, an attempt has been made to increase the solubility of Nifedipine in by the preparation of solid dispersion and to formulate Fast disintegration tablets of Nifedipine using various techniques. Nifedipine was scanned in the UV wavelength region of 200-400 nm for maximum absorption (λ_{max}) and the λ_{max} was found to beat 237.5nm (Fig1) that was almost same as reported value (238 nm)[57]. Standard curve of the drug (Fig 2) prepared in Phosphate Buffer PH 7.4 showed a linear relationship between the concentration and absorbance values in the range of 2–10 g/ml. R^2 value and slope was found to be 0.992 and 0.0796 respectively.

The Drug-excipient interaction study was then carried out using the super saturation method to determine the solubility of Nifedipine in various solvents and the solutions of various carriers. Thus according to the data in table 9, Nifedipine was found to be soluble in Acetone, Methylene Chloride, Chloroform, Methanol, Ethanol and Ethyl Alcohol but was practically insoluble in water. The solubility in Phosphate Buffer of pH 7.4 and 8 was found to be 0.025 and 0.012 respectively which indicated very poor solubility. Thus an attempt was made to increase the solubility of Nifedipine in Phosphate Buffer of pH 7.4 i.e. the Buffer simulating the saliva in mouth by the formulation of solid dispersion.

The solubility study of Nifedipine was carried out using the super saturation method to determine the solubility of Nifedipine in in the solution of various carriers. The carriers for the preparation of solid dispersion were selected on the basis of the solubility studying Phosphate Buffer pH 7.4. Results are tabulated in Table 10 and depicted in Figure3. From the data in Table 10 it was observed that the solubility of Nifedipine increased as the concentration of Mannitol, Urea, PVPK30 and PEG8000 increased. Solubility was also increased with PEG 4000 and PEG 6000, but to a lesser extent.

In order to check for possible drug-excipients interaction the infrared spectra of Nifedipine, Mannitol, physical mixture of Nifedipine-Mannitol and the physical mixture of Nifedipine with other tablet excipients were recorded using a FTIR spectrophoto meter to check. Distinct peak in the region 3000-2850cm^{-1} for C-H aliphatic, 1350-1000cm^{-1} for C-Nadine and 3500-3100 cm^{-1} for 2^0 amine and 1550 $cm^{-}1$ and 1350 cm^{-1} for the Nitro group of the physical mixture was identical to that of pure drug which confirm the compatibility of the drug and excipients. The spectra are shown in figure 4 (a) and 4(b). The IR spectra of pure Nifedipine, Mannitol, Nifedipine-Mannitol physical mixture was recorded using FTIR, and are shown in figure 4(a), 6(c), and 6(d) respectively. Distinct peak in the region 3000-2850 cm^{-1} for C-H aliphatic, 1350-1000cm^{-1} for C-N amine and 3500-3100cm^{-1} for 2^0 amine and 1550

cm^{-1} and 1350 cm^{-1} for the Nitro group of the drug complexes was identical to that of pure drug which confirm the compatibility of the drug and carrier. The infrared spectrum of Nifedipine and Physical mixture of Nifedipine with other excipients indicated that there was no chemical interaction found between Nifedipine and other excipients.
On the basis of the solubility studies and the drug-excipient interaction study, Mannitol, Urea, PVPK30 and PEG8000 were selected as the carriers for the preparation of solid dispersion which were prepared by solvent evaporation method. Amongst the prepared solid dispersions, the solid dispersion prepared with PVPK30 was rejected as it was exhibiting problem of stickiness.

All other solid dispersions were subjected to in vitro dissolution studies using USPXXII dissolution test apparatus type II. The results of the In-vitro dissolution are tabulated in table11, 12, 13 and depicted in fig 5,6,7. From the release profile it was observed that as the ratio of carrier increased the percentage release also increased. From the released epicted in table 14 it was observed that at the end of fifty minutes solid dispersion of Mannitol (1:4) showed highest cumulative release of 37.4%. as compared to PEG 8000 and Urea Hence the solid dispersion of Nifedipine: Mannitol (1:4) was selected for the preparation of fast dissolving tablets using cross carmellose sodium and sodium starch Glycolate as super Disintegrants. From the release profile it was observed that as the ratio of carrier increased the percentage release also increased. From the released epicted in Fig 8 it was observed that at the end of fifty minutes solid dispersion of Mannitol (1:4) showed highest cumulative release of 37.4%. as compared to PEG 8000 and Urea. Hence the solid dispersion of Nifedipine: Mannitol (1:4) was selected for the preparation of fast dissolving tablets using cross carmellose sodium and sodium starch Glycolate super destine grants.
Based on the literature search, the widely accepted Sodium Starch Glycolate and Cross Carmellose Sodium were selected as super Disintegrants for the present work. The selected solid dispersion solid dispersion was blended with Cross Carmellose Sodium and Sodium Starch Glycolate with other excipients (table 3 a.-3d) and evaluated for pre and post compression parameters Preformulation studies were carried out on the powder blend for the tablets. The flow properties of the blend (F1-F18) were evaluated by determining the Carr's index, Hausner ratio and angle of repose. Poured density, tapped density, Carr's index, Hausner ratio and Angle of repose of the blend for formulation FC to F16 are shown in Table 15 Poured density values of different batches were found to range between 0.518 and 0.585 gm/ml^3, whereas tapped density values were found to vary from 0.641 to 0.668 gm/ml^3. Carr's index, Hausner ratio and angle of repose were range between 18.24 to 20.30, 1.22 to1.25, and $21^o40'$ to $29^o66'$ respectively, which indicates that the powder blend for tablet six habit good flow properties. The powder blend with good flow properties was subjected to direct compression to formulate Fast dissolving Tablets (FC, F1-F16).

Post Compression studies were carried out to evaluate the tablets (FC-F16) for tablet properties like thickness, hardness, friability, disintegration time, weight variation, wetting time and drug content uniformity The values of thickness, hardness, friability, disintegration time, weight variation, wetting time and drug content uniformity of all the formulations are shown in Table16 and Table17 Tablet thickness was found to range from 2.10±0.03 to 2.12±0.07 mm. Tablets of all the batches were found out to exhibit sufficient hardness, which ranged from 3.10±0.23 to 4.00±0.13 Kg/cm^2. Wetting time of the tablet was found to be in the range of 6.79±1.712 sec to 32.46±2.488 sec. Friability, weight variation test and percentage drug content uniformity met the specification given in the literature.

The disintegration time of the formulation F1 to F16 were compared to FC (the control tablet which contains no super Disintegrants). The disintegration time of FC was found to be 1 min 49 sec, i. e. 100sec. In the formulations with only Croscarmellose sodium as super-Disintegrants in different ratios, F4 (CCS: 3 Percentage) was observed to have the least disintegration time i.e. 57 seconds and in the formulations with only Sodium Starch Glycolate in different ratios., F8 (SSG: 3 Percentage) was observed to have the least disintegration time i.e. 56 seconds. Amongst the eight formulations (F1-F8), F8 was observed to have the least disintegration time, thus when the super Disintegrants were used individually, sodium starch Glycolate was found to decrease the disintegration time to a larger extent.
When a physical mixture of Cross carmellose sodium and Sodium Starch Glycolate was used in different ratios (F9-11), F11, containing Cross carmellose sodium and Sodium Starch Glycolate, 1 % and 2 % respectively was observed to have the least disintegration time of 50 seconds. In the other formulations with a co-processed blend of Croscarmellose sodium and Sodium Starch Glycolate was used in different ratios, formulation F15 containing Cross carmellose sodium(1%) and Sodium Starch Glycolate (2%) was observed to have the least disintegration time i.e. 49 seconds. Hence amongst the eight formulations (F9-F16), F15 was observed to have the least disintegration time, thus when the two super Disintegrants were used as a physical mixture and co-processed blend, the tablet prepared by the

co-processed blend is observed to decrease the disintegration time by larger extent.

In-vitro dissolution studies were carried out for formulations FC-F16 to evaluate the cumulative drug release. The results are tabulated in table 18 and depicted in Fig 13,14, 15 and 16. The drug release of the formulation F1 to F16 was compared to FC (the control tablet which contains no super Disintegrants). The drug release of FC was found to be 38.8%. In the formulations with only Cross carmellose sodium as super- Disintegrants in different ratios, F4 (CCS: 3 Percentage) was observed to have the highest drug release of 71.3% and in the formulations with only Sodium Starch Glycolate in different ratios., F8 (SSG: 3 Percentage) was observed to have the highest drug release of 71.6%. Amongst the eight formulations (F1-8), F8 was observed to have the highest drug release, thus when the super Disintegrants were used individually, sodium starch Glycolate was found to increase the drug release to a larger extent

When a physical mixture of Cross carmellose sodium and Sodium Starch Glycolate was used in different ratios (F9-11), F11, containing Croscarmellose sodium and Sodium Starch showed the highest drug release of 73.3%. In the other formulations with a co- processed blend of Croscarmellose sodium and Sodium Starch Glycolate was used in different ratios, formulation F15 containing Croscarmellose sodium (1%) and Sodium Starch Glycolate (2%) was observed to have the highest drug release of 74%.Hence amongst the eight formulations (F9-F16), F15 was observed to have the highest drug release, thus when the two superdisintegrants were used as a physical mixture and co-processed blend, the tablet prepared by the co-processed blend is observed to increase the drug release of by larger extent.

6.CONCLUSION

Nifedipine is a dihydropyridine calcium channel blocker. Its main uses are as an Antianginal (especially in Prinzmetal's angina) and antihypertensive Solid dispersions of Nifedipine was prepared to increase its solubility. The Solid dispersions were prepared by solvent evaporation technique and were characterized by IR. The solid dispersion so prepared giving the highest increase in solubility (Nifedipine: Mannitol-1:4) were further used in the preparation of fast dissolving tablets. Tablets were prepared by direct compression method using two different superdisintegrants. Desired results (49 sec) were achieved with the formulations containing the Nifedipine-Mannitol solid dispersion (1:4) which was prepared by solvent evaporation method and containing co-processed mixture of Cross Carmellose Sodium and Sodium Starch Glycolate. It can thus be concluded that FDTs containing Nifedipine-Mannitol solid dispersion with less disintegration time can be prepared by direct compression method using co-processed mixture of Cross Carmellose Sodium and Sodium Starch Glycolate in the ratio 1% and 2% respectively as superdisintegrants.

BIBLIOGRAPHY

1. Chien YW. Novel drug delivery systems. New York – Marcel Dekker Inc., 2nd ed. 1992.p.139-140.
2. Indurwade NH, Rajyaguru TH, Nakhat PD. Novel approach– Fast dissolving tablets. Indian Drugs 2002; 39 (8): 405-414.
3. Amarjit S, Rajesh J. United states Patent No.7122198. Fast dissolving composition with prolonged sweet taste.
4. Kuchekar BS, Atul, Badhan C, Mahajan, H S, Mouth dissolving tablets: A novel drug delivery system. Pharma Times 2003; 35:7-9.
5. Allen LV, Wang B, Particulate support matrix for making a rapidly dissolving tablet, 1997, US Patent 5595761.
6. Bogner RH, Wilkosz MF. Fast-Dissolving tablets. U.S. Pharmacist- A Jobson Publication.
7. Habib W, Khankari RH, Hontz J. Fast-dissolving Drug Delivery System. CritRev Ther Drug Carrier Syst. 2000; 17:61-72.
8. Chang RK, Guo X, Burnaside B, Couch R, Fast-Dissolving Tablets. Pharm Technol. 2000; 24 (6): 52-60.
9. Reddy L H, Ghosh B, Rajneesh. Fast dissolving drug delivery systems: A review of the literature. Ind J Pharm Sci 2002; 64 (4) : 331-336.
10. Sreenivas SA, Dandagi PM, Gadad AP, Godbole AM, Hiremath SP, Mastiholimath VS, et al. Orodispersible tablets: new-fangled drug delivery system-a review. Ind J pharm educ res 2005; 39 (4): 177-181.
11. Bhandari S, Mittapalli KR, Gannu R, Rao YM. Orodispersible tablets: An overview. Asian J Pharm 2008:2-11.
12. Biradar SS, Bhagavati ST, Kuppasad IJ. Fast dissolving drug delivery systems: A brief overview. Int J Pharmacol

2006; 4(2):1-7.
13. http://www.uspharmacist.com/oldformat.asp?url=newlook/files/feat/fastdissolving.htm [as on 2008 Dec12.]
14. EspositoE, RoncaratiR, Cortesi R.Production of Eudragit micro particles by spray drying technique: influence of experimental parameters on morphological and dimensional characteristics. Pharm. Dev. Tech. 2002;5:267-278.
15. Davis HP, Illum SS, Chitosan microspheres prepared by spray drying. Int J. Pharm.1999;187:53-56.
16. MartinoPD, Scoppa M, Joiris E.,Palmieri GF, PourcelotY, Martelli S. The spray drying of acetazolamide as method to modify crystal properties andto improve compression behavior. Int. J. Pharma.2001; 213:209-221.
17. Chaudhari PD, Chaudhari SP, Kolhe SR, Dave KN, More DM, Formulation and evaluation of fast dissolving tablet of famotidine. Indian Drugs. 2005;10:641- 649.
18. Cumming, Kenneth I, Harris, Elaine. United States patent 6153220. Taste masked formulations.
19. Zade PS, Kawtikwar PS, Sakarkar DM, Formulation, evaluation and optimization of fast dissolving tablet containing Tizanidine hydrochloride. Int. J. Pharm. Tech. Research. 2007;1(1): 34-42
20. Shishu, Bhatti A, Singh T, Preparation of tablets rapidly disintegrating in saliva containing bitter-taste masked granules by compression method. Ind. J. Pharm. Sci.2007; 69 (1); 80-84.
21. Madgulkar A, Kadam S, Pokharkar V, Development of trilayered muco adhesive tablet of Itraconazole tablet with zero-order release. Asian.J. Pharmaceutics.2008; 57-60.
22. Anand V, KandarapuR, Garg S, Preparation and evaluation of taste-maskers orally disintegrating tablets of Prednisolone Asian J. Pharm. Sci. 2007; 2(6): 227-238.
23. Shishu and Bhatti A, Fast Disintegrating tablets of Diazepam. Indiandrugs. 2006; 43 (8): 643-648.
24. Mishra D, Madhu B, Shailendra KS, and Sengodan GV. Spray Dried Excipient: A Novel Technique for the Formulation of Orally Disintegrating Tablets.Chem. Pharm. Bull. 2006; 54(1): 99-102.
25. Paradkar A, Anshuman A, Jadhav BK, Mahadik KR. Characterization of curcumin-PVP solid dispersion obtained by spray drying. Int. J Pharmaceutics. 2004; 271: 281-286.
26. Gonnissen Y, Remon JP, Vervaet C. Effect of maltodextrin and superdisintegrant in directly compressible powder mixtures prepared via co-spray drying. Eur J Pharm Sci 2007:1-6.
27. Paradkar A, Chauhan B, Shimpi S. Preparation and evaluation of glibenclamide-polyglycolized glycerides solid dispersions with silicon dioxide by spray drying technique. Euro. J. Pharma. Sci. 2005; 26:219-230.
28. Leuner C,Dressman J. Improving drug solubility for oral delivery using solid dispersions. Eur J Pharm Biopharm 2000; 50: 47-60.
29. Jain CM, Naruka PS, Formulation and evaluation of fast dissolving tablets of Valsart an. Int. J. Pharmacy and Pharm. Sci. 2009;1(1):219-226.
30. Dinesh B M, Patel YR, Patil UA, Rajani GP, Desai BG. Formulation and evaluation of dispersible tablets of Valdecoxib. Pharma buzz 2007; 2(10): 25-31.
31. http://www.freepatentsonline.com/6238695.html [as on 2008 Dec12].
32. Sharma S. Gupta GD. Formulation and characterization of fast dissolving tablet of promethazine theoclate. Asian J Pharm. 2008:70-72.
33. Jacob S, Shirwaikar A, Joseph A, Srinivasan KK. Novel Co-processed excipients of mannitol and microcrystalline cellulose for preparing fast dissolving tablets of glipizide. Indian J. Pharm. Sci 2007; 69 (5): 633-639.
34. Setty CM, Prasad DVK, Gupta VRM, SaB. Development of fast dispersible Aceclofenac tablets: Effect of functionality of superdisintegrant. Ind J Pharm Sci 2008: 180-185.
35. Khan S, Kataria P, Nakhat P, Yeole P. T as temasking of On dansetron hydrochloride by polymer carrier system and formulation of rapid dissolving tablets. AAPS Pharm Sci Tech 2007;8(2):E1-7.
36. Patel DM, Patel NM, Shah RR, Jogani PD, Balapatel AI. Studies informulation of or odispersible tablets of Rofecoxib. Ind J Pharm Sci 2004; 66 (5): 621-5.
37. Mulla JA, Dasankoppa FS, Vilas GJ, Sholapur HP. Fast dissolving tablets of promethazine: A novel oral formulation for the treatment of fractionated radio therapy induced nausea and emesis. Ind drugs 2008;45(4): 314-317.
38. Pignatello R, Ferro M, Puglisi G. Preparation of solid dispersions of nonsteroidal anti-inflammatory drugs with acrylic polymers and studies on mechanism of drug polymer interactions. AAPS Pharm Sci Tech 2003 ;(2):1-11.
39. Ishikawa T, Watanabe Y, Utoguchi N, Matsumoto M. Preparation and evaluation of tablets rapidly disintegrating in saliva containing bitter-taste-masked granules by the compression method. Chem Pharm Bull 1999; 47(10): 1451-1455.

40. Swamy PV, Areefulla SH, Shirsand AB, Gandra S, Prashanth B. Orodispersible tablets of meloxicamusing distintegrants blends for improved efficacy. Ind J Pharm Sci 2007; 69(6): 836-840.
41. Bhowmick Detal, Fast Dissolving Tablet: An Overview, Journal of Chemical and Pharmaceutical Research.
42. Sheeba F.R. et al., Formulation and development of Nifedipine Sublingual tablets, Asian journal of pharmaceutical and clinical research, Vol 2 Issue 3, July–Sept.2009.
43. Tiwari v. k et al, Preparation and evaluation of fast dissolving tablets of Celecoxib, Journal of current Pharmaceutical research
44. N.G. raghavendra Rao, etal, Formulation and evaluation of mouth dissolving tablets of Metoprolol Tartarate by sublimation method, International Journal of Pharma and bio Sciences, V1(2)2010
45. N.G.raghavendra Rao, et al, Formulation and Design of Felodipine using Novel co-processed superdisintegrants, International Journal of Pharma Research and Development, VOV-2/issue9 (Nov)017
46. S.Kunte and P.Tandale, Fast Dissolving Strips: A novel approach for the delivery of Verapamil, Journal of Pharmacy and Bio Allied Sciences.
47. N.G. raghavendrarao, et al, Design of Fast Dissolving Tablets of Chlorthalidone using, Novel co-processed superdisintegrants, Journal of Chemical and Pharmaceutical Research, J Chem Pharm Res, 2010, 2(4): 671-679
48. Appa Rao. Et al Formulation and Evaluation of Aceclofenac Solid Dispersions for Dissolution Rate Enhancement; International Journal of Pharmaceutical Sciences and Drug Research 2010; 2(2):146-150 Nifedipine. USP30-NF25 [book on CD ROM]2007
49. http://www.chemicalland21.com/lifescience/uh/NIFEDIPINE.htm. (As on25-11- 2008).
50. Goodman & Gilman's The Pharmacological basis therapeutics. 3rd ed. New York: Mc Graw-Hill Companies. [Book on CD-ROM] 2006.
51. Clarke's Analysis of Drugs and Poisons 3rd ed. London. Pharmaceutical Press. [Book on CD-ROM] 2005.
52. Rowe RC, Sheskey PJ, Weller PJ. Handbook of pharmaceutical excipients. 4thed. London: Pharmaceutical press. [Book on CD-ROM] 2003.
53. Rowe RC, Whiskey PJ, Weller PJ. Handbook of pharmaceutical excipients.4th ed. London: Pharmaceutical press. [Book on CD-ROM] 2003.
54. Rowe RC, Sheskey PJ, Weller PJ. Handbook of pharmaceutical excipients. 4thed. London: Pharmaceutical press. [Book on CD-ROM] 2003.
55. Clarke's Analysis of Drugs and Poisons 3rd ed. London. Pharmaceutical Press. [Book on CD-ROM] 2005.
56. Y.Lilith, P. K.Lakshmi, Enhancement of Dissolution of Nifedipine by Surface Dispersion Technique, International Journal of Pharmacy and Pharmaceutical Science ISSN- 0975-1491 Vol 3 Suppl 3, 2011.
57. Kemp W. Organic spectroscopy. 3rd ed. London: Palgrave 1991: p.19-96.
58. Slog DA, Holler FJ, Nieman TA. Principles of instrumental analysis. 5thEd. Singapore: Thomson Asia pvt ltd 1998: p.380-426
59. Aulton ME. Pharmaceutics – The Science of dosage form design. 2nd Ed. New York: Churchill Living stone; 2002: p.133-137.
60. Lachman L, Liberman HA, Kanig JL. The theory and practice of industrial pharmacy. 3rd Ed. Bombay: Varghese publishing house; 1991. P.296-303.

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