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Research Article

FORMULATION AND *IN-VITRO* RELEASE STUDY OF SPARINGLY SOLUBLE DRUG NIFEDIPINE USING SOLID DISPERSION METHOD

Thanga Ezhil Kumaran*, S. P. Senthil, V. Ganesan, S. Balaji
Department of Pharmaceutics, The Erode College of Pharmacy and Research Institute, Erode, Tamilnadu, India

*Thanga Ezhil Kumaran, M. Pharm, Department of Pharmaceutics, The Erode College of Pharmacy & Research Institute, Perundurai Main Road, Erode – 638112, Tamilnadu, India
Email: goldezhil@gmail.com
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ABSTRACT
Since the drug Nifedipine is insoluble in water, it was selected to formulate in the form of the solid dispersion in order to increase its dissolution. Also the carrier was selected because they are freely soluble in water. The standard curve of Nifedipine was prepared with the concentration of the solution ranging from 2 – 14 µg/ml. The absorbance was measured at 350nm using spectrophotometer. The solid dispersion of Nifedipine was formulated by using melting or fusion method. The drug and carrier was weighed and heated in a china dish in a water bath upto melting of both materials. The different formulations of Nifedipine – Mannitol (1:1, 1:2, 1:3) and Nifedipine – Urea (1:1, 1:2, 1:3) were formulated and was subjected to the dissolution rate studies in pH 7.4 buffer solution. The in-vitro release studies and the drug content for the formulated solid dispersion were carried out. On the basis of dissolution studies, we found that 1:1 (drug:mannitol) solid dispersion showed a marked increase in the dissolution rates when compared to the pure drug. The increase dissolution rates observed in all the cases of the solid dispersion could be mainly due to reduction in particle size.

KEYWORDS: Nifidepine, Urea, Mannitol.

INTRODUCTION
Since the drug Nifedipine is insoluble in water, it was selected to formulate in the form of the solid dispersion in order to increase its dissolution. Also the carrier was selected because they are freely soluble in water. The solid dispersion was prepared mostly by solvent-base method, fusion-melt method, fusion-solvent method[5-7].

MATERIALS AND METHODS
Preparation of Standard Curve: 100mg of Nifidipine was weighed and dissolved in phosphate buffer contained in a volumetric flask and the volume was made upto 100ml with the buffer solution[8]. The second dilution was made by transferring 5ml of the stock solution to 50ml volumetric flask and make up the volume. From this different concentration of the solution was made ranging from 2 – 14 µg/ml. The absorbance was measured at 350nm using spectrophotometer. Graph – 1 shows the standard curve of Nifidipine.
Method of Preparation of Solid Dispersion: The solid dispersion of Nifedipine was formulated by using melting or fusion method[4]. The carrier used for the preparation of solid dispersion was Mannitol and Urea. The drug and carrier was weighed and heated in a china dish in a water bath upto melting of both materials. After melting the solution was poured on a porcelain tile, which is pre cooled by an ice cubes. The materials were collected and sieved through a fine sieve. The different formulations of

Nifedipine – Mannitol[9] (1:1, 1:2, 1:3) and Nifedipine – Urea[9] (1:1, 1:2, 1:3) were formulated and was subjected to the dissolution rate studies in pH 7.4 buffer solution[4].

In-vitro Release Studies: The dissolution study was performed by using the phosphate buffer of pH 7.4. The temperature was maintained at 37^0C. The rotation speed was maintained at 25rpm[8]. 1ml of the dissolution medium was pipette out at the intervals of 10 minutes for 1 hr, and the same amount of the buffer medium was replaced to it. The pipetted samples were observed in UV spectrophotometer at 350nm[8]. Table – 2 shows the cumulative release of drug Nifidipine: Mannitol, while Table – 3 shows the cumulative release of drug Nifidipine: Urea. The comparative study of the release of the drug with different ratios of Mannitol and Urea is shown in graph – 2 and graph – 3 respectively.

Drug Content: The prepared solid dispersion of Nifedipine were shaken with 100ml of phosphate buffer pH 7.4 and kept for overnight. The solution was filtered and measured at 350nm[1-4].

RESULT

The formulation of solid dispersions of Nifedipine with various carriers like mannitol and urea were screened for the selection of suitable carriers. These carriers were found to be encouraging, since they did not undergo any chemical change during the preparation of solid dispersion. On the basis of dissolution studies, we found that 1:1 (drug: mannitol) gave maximum release of 97.3%. Almost all the formulation of 1:1 (drug: mannitol) has 95 – 98% drug content.

DISCUSSION

All solid dispersion of Nifedipine showed a marked increase in the dissolution rates when compared to the pure drug. The solid dispersion of Nifedipine with mannitol showed a high dissolution rates compared to the dissolution rates of Nifedipine solid dispersion system with other carrier (urea).

The increase dissolution rates observed in all the cases of the solid dispersion could be mainly due to reduction in particle size.

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Table 1: Shows the percentage cumulative release of pure drug Nifedipine

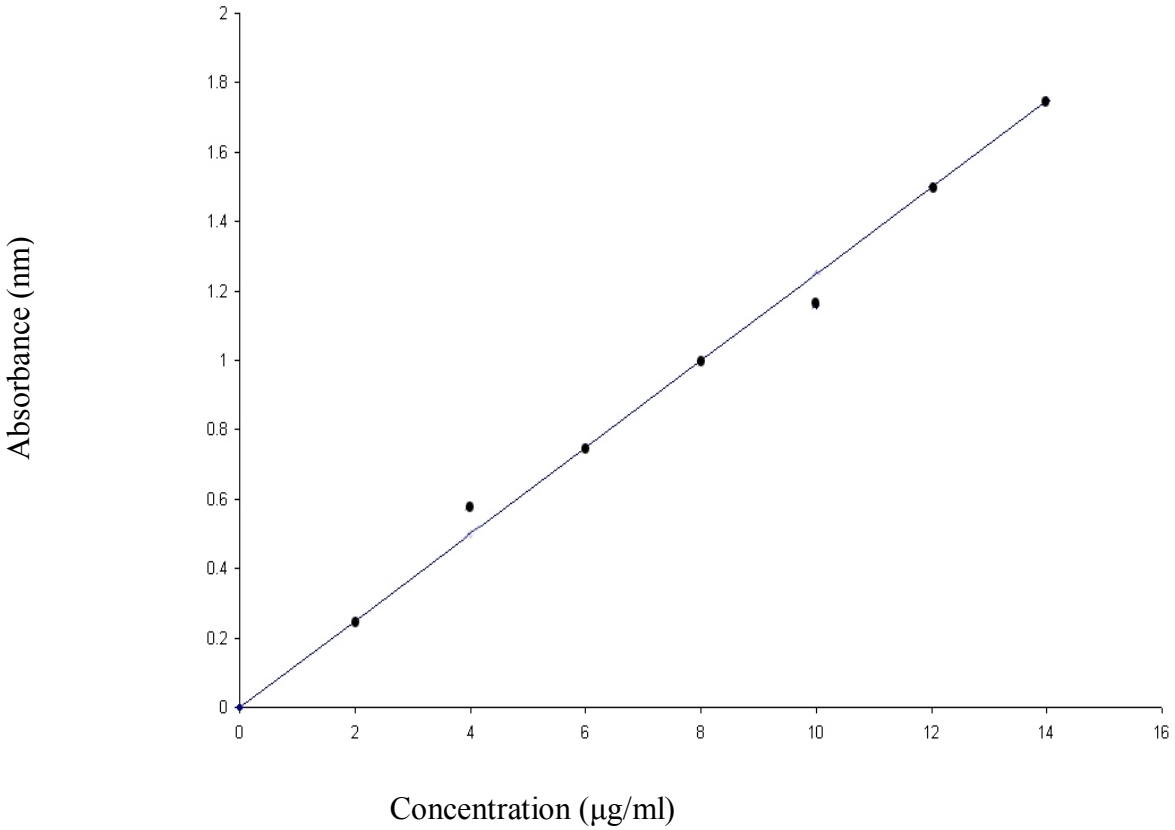
S. No	Time (Hrs)	Cumulative Drug Release (%)
1	1	10.5
2	2	15.7
3	3	22.4
4	4	30.4
5	5	36.3
6	6	42.8

Table 2: Shows the cumulative drug release of formulations containing different ratios of Nifedipine and Mannitol. From these releases it was found that the formulation containing 1:1 of Nifedipine and Mannitol has good capability to release the drug

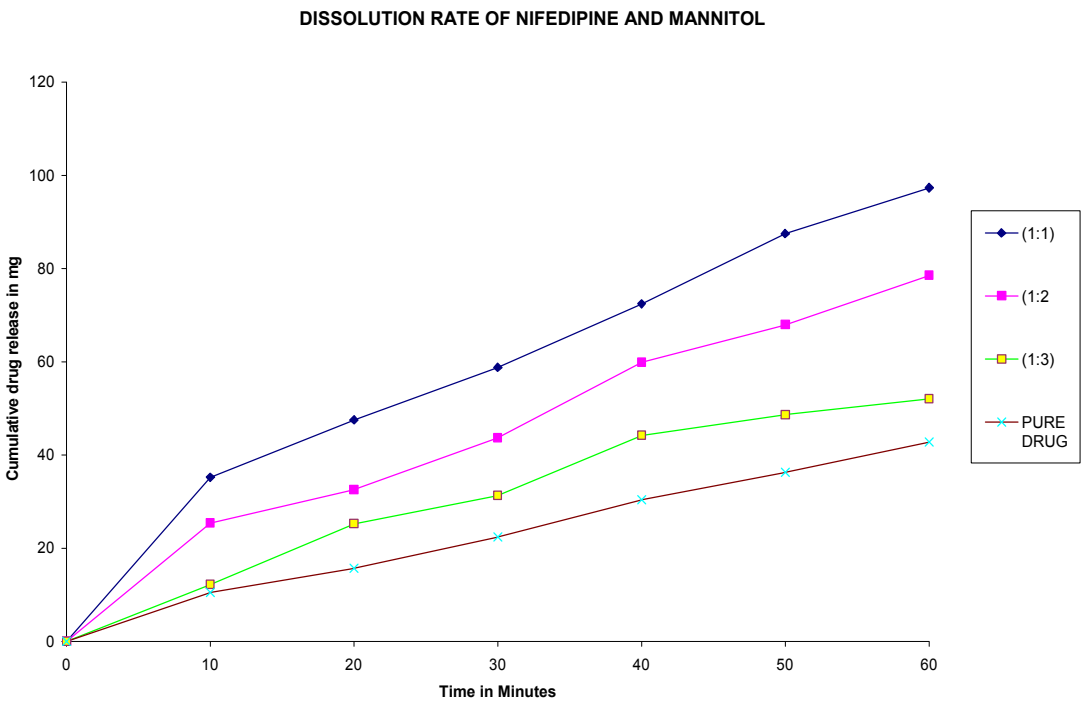
S. No	Time (Hrs)	Cumulative Drug Release (%)		
		1:1	1:2	1:3
1	1	35.2	25.4	12.2
2	2	47.5	32.6	25.2
3	3	58.8	43.7	31.3
4	4	72.4	59.9	44.2
5	5	87.5	67.9	48.7
6	6	97.3	78.5	52.1

Table 3: Shows the cumulative drug release of formulations containing different ratios of Nifedipine and Urea. From these releases it was found that the formulation containing 1:1 of Nifedipine and Urea has good capability to release the drug.

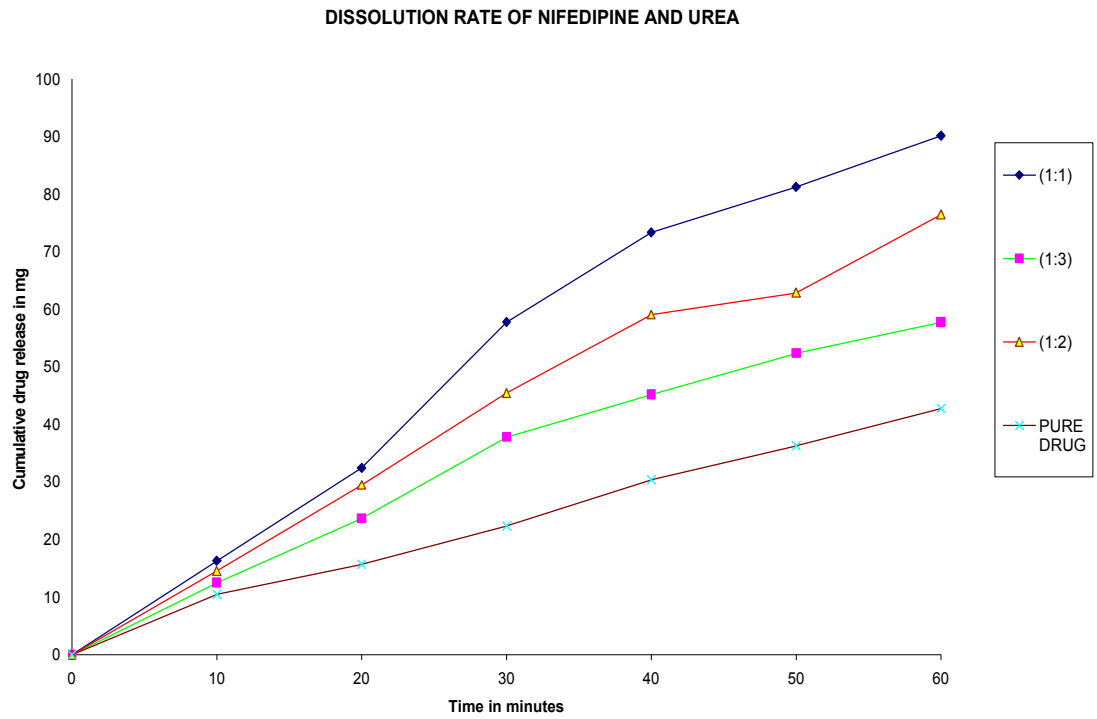
S. No	Time (Hrs)	Cumulative Drug Release (%)		
		1:1	1:2	1:3
1	1	16.3	14.6	12.5
2	2	32.5	29.5	23.7
3	3	57.8	45.5	37.8
4	4	73.4	59.1	45.2
5	5	81.3	62.9	52.4
6	6	90.2	76.5	57.8



Graph 1: Shows the standard curve of Nifedipine to find out the slope value.



Graph 2: Shows the comparative study of cumulative release of different ratios of Nifedipine and Mannitol.



Graph 3: Shows the comparative study of cumulative release of different ratios of Nifedipine and Urea.

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