Increasing Drug Solubility with Solid Dispersions of SilSol™ 6035 Silica Formulated Into Sublingual Tablets

Introduction

Improving the solubility of BCS class 2 drugs is a continuing challenge for the pharmaceutical formulator. Improving solubility could allow for formulations using significantly less active and open the door to new dosage forms and avenues for lifecycle extensions. Creating solid dispersions are a promising way to improve drug solubility. Grace SilSol™6035 has a specifically engineered surface and pore distribution to enable stable amorphous dispersions by solvent deposition. Poorly soluble Nifedipine was loaded on SilSol™ 6035 silica to make a solid dispersion with enhanced water solubility. Nifedipine is stabilized in its amorphous form by confinement effects of the engineered pore size of the silica. This solid dispersion greatly improves the solubility of Nifedipine and, since it is a free flowing powder, is easily formulated into solid oral dosage forms such as tablets.

Materials and Methods

1. Nifedipine was loaded on SilSol™ 6035 using solvent method of drug loading: saturated solution of Nifedipine was prepared in acetone and adsorbed on SilSol™ 6035 drop wise with continuous stirring and drug was allowed to penetrate in Silica pores. Acetone was evaporated. Dissolution study was conducted to confirm the successful drug loading and increased water solubility.

Release of Nifedipine from SilSol™ 6035 dispersion

The release study was conducted in water as a dissolution media using USP apparatus II. SilSol™ helps to get 100% of Nifedipine released in first 5min while less than 10% was released from the pure drug powder.

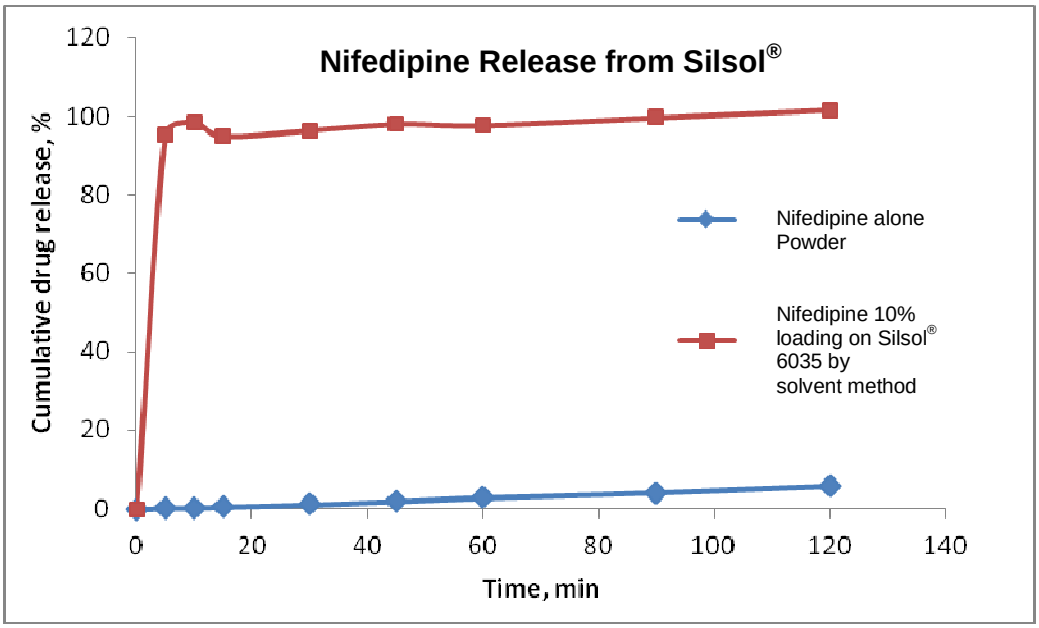

Figure 1: Dissolution of Nifedipine from SilSol™ 6035 and alone drug

2. The tablets of obtained solid dispersion was compressed using formula mentioned below:

Ingredients	mg/tab
Nifedipine Dispersion (10% drug on SilSol™ 6035)	100
Mannitol	140.85
Cross povidone	37.8
Poly vinyl acetate	7.85
Sodium saccharine	3
Syloid 244 FP	3
Magnesium stearate	1.5
Citric acid	6
Total	300

Table 1: Formulation of Nifedipine sublingual tablets using SilSol™ 6035 and Syloid® 244FP

3. Syloid® 244FP was used as glidant which also helps to increase saliva diffusion in tablets.
4. Lubricated powder was subjected to compression by using Eliza Press 200 tablet press.
5. In process quality control parameters were evaluated for the manufactured tablets.

Results

The prepared tablets were evaluated for various parameters and observations of the same are reported in table below:

Parameter	Mean ±SD
Weight variation (mg)	299.35
Hardness (Kg/cm^2)	6.52
Thickness (mm)	5.67
Friability (%)	0.07
Wetting time (sec)	22.21
***In vitro* dispersion time (sec)**	41.32
Water absorption ratio (%)	53.22

Table 2: Observations of Nifedipine sublingual tablets

Conclusions

SilSol™ 6035 helps to increase the solubility of poorly soluble drugs like Nifedipine. Drug loaded SilSol™ can easily compressed into sublingual tablets using Syloid® 244FP as glidant. The hydrophilic surface and Porous nature of SilSol™ 6035 help to increase drug release for immediate absorption. The platform technology can be effective to increase bioavailability of poorly soluble drugs from BCS II and IV class by creating solid dispersions and formulating into solid dosage forms.

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