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Research Article

FORMULATION AND EVALUATION OF QUICK RELEASING TABLETS OF CARVIDILOL

Sirisha. M[1]*, Balaji Reddy.R[2], Sandhya. P[1], V.S.N.Murthy[3], Swathy. K[3], Lavanya. Ch[3]
[1]Shadan Womens College of Pharmacy, Khairatabad, Hyderabad-4, Andhra Pradesh.
[2]Deccan School of Pharmacy, Hyderabad, Andhra Pradesh.
[3]Teegala Ram Reddy College of Pharmacy, Meerpet, Hyderabad-79, Andhra Pradesh.
Email:chinnu_dgp@yahoo.com

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Abstract

Tablet dosage forms are the widely accepted conventional dosage forms. Quick or fast dissolving tablets has many advantages over conventional tablets. It is the more convenient dosage form for geriatric, pediatric and travelling patients where water is not available.

Carvedilol, a hypertensive drug, rate of drug absorption is controlled by dissolution of the Carvedilol tablets. Hence, increase in the rate of dissolution increases the rate of absorption of Carvedilol. Quick or fast dissolution of the Carvedilol is achieved by the use of disintegrant along with super disintegrant[1,3]. The formulation containing 5% super disintegrant has shown 91.5% drug release in 25 min and 97.8% drug release[8] in 30 min with 4.06 hardness. The formulation containing 20% of disintegrant (super disintegrant and binding agent in 1:3 ratio)[4,5] to the weight of the tablet has shown quick release of the tablet with 96.3% of drug content release[8] in 25 minutes and 3.43 hardness. The formulation containing 25% disintegrant (super disintegrant and binding agent in the ratio of 2:3) has shown 97.43% drug release[8] in 20 min and hardness 3.43.

Key words: Quick releasing tablets, Fast releasing tablets, Carvedilol, Super disintegrant.

Introduction

Tablets are solid unit dosage form of medicaments with or without suitable diluents and prepared either by molding or compression. They have wide acceptance because of ease of administration, stability and many advantages over other

formulations.

Now a days, there is increasing demand for the quick releasing or fast dissolving drug delivery systems, that dissolves disintegrates in the oral cavity without need of water or chewing. These are also called melt-in-mouth tablets, repimelts, porous tablets, oro-dispersible, quick dissolving or rapid disintegrating tablets. Ease of administration to patients who refuse to swallow a tablet such as pediatric, geriatric patients and psychiatric patients. Convenience of administration and accurate dosing as compared to liquids[1]. No need of water to swallow the dosage form[5], which is highly convenient feature for patients who are traveling and do not have immediate access to water[3]. Good mouth feel property helps to change the basic view of medication as "bitter pill", particularly for pediatric patients[4].

Carvedilol[10,11,12] is a potent antihypertensive agent with a dual mechanism of action[2]. At relatively low concentrations it is a competitive beta-adrenoceptor antagonist and a vasodilator, whereas at higher concentrations it is also a calcium channel antagonist. Carvedilol is class-2 drug under biopharmaceutical classification system with low solubility and high permeability, its dissolution is the rate limiting step in its absorption.

Carvedilol is a nonselective β-blocker useful in the treatment of hypertension. Carvedilol is poorly soluble in aqueous media. Being a class II drug, it exhibits low solubility and high permeability. Due to its solubility characteristics dissolution is the rate limiting step in the drug absorption present work involves attempts to improve dissolution rate through formulation of fast dissolving tablets of Carvedilol.

Materials and Methods

Carvedilol, quick releasing tablets are prepared by wet granulation method using rotary tablet press (Cadmach). Tablets are prepared using the following four formulations (T1, T2, T3 and T4) using different concentrations of binding agent (Maize Starch)[5] and super disintegrant (Croscarmellose sodium) as shown in Table.1. Weight of each tablet is adjusted 300 mg with lactose as diluent.

Table.1: Amount of ingredients in the Carvedilol quick releasing tablet formulations T1 to T4.

MATERIAL IN EACH TABLET (MG)	T1	T2	T3	T4
Carvedilol (Dr.Reddy's)	25	25	25	25
Maize starch (S.D. fine chem.)	45	-	45	45
Croscamellose sodium (Meric labs)	-	15	15	30

Talc (S.D. fine chem.)	6	6	6	6
Magnesium stearate (S.D. fine chem.)	6	6	6	6
PVP in alcohol	3	3	3	3
Lactose (S.D. fine chem.)	215	245	200	185

Results and Discussion

The tablets made from the four formulations T1 to T4 formulation are evaluated for hardness, friability, weight variation, content uniformity, disintegration time and dissolution rate.

The evaluations results of the formulations T1 to T4 formulations are as shown in Table. 2.

FORMULATION	HARDNESS (Kg/Cm^2)	FRIABILITY (%)	DISINTEGRATION TME(Sec)	DRUG CONTENT (%)
T1	4.36	1.12	240	89
T2	4.06	0.91	45	94
T3	3.43	1.45	20	92
T4	3.43	1.13	16	92

Table-2: Results obtained from the evaluation of Carvedilol quick releasing formulations of T1 to T4 formulations.

All the tablets also evaluated for drug release using UV spectrophotometer (Elico) with the standard curve (dilutions containing 1,2,3,4 and 5 µg Carvedilol in 0.1 N HCl) at 243nm^2, Percentage of drug release is calculated from all the formulation are as follows.

(i) The release study from the T 1 formulation has shown the results as given in Table. 3 and Fig.1.

TIME (MIN)	ABSORBANCE	CUMULATIVE % DRUG RELEASED	%REMAINING TO BE RELEASED
5	0.113	41.2	58.8
10	0.158	57.63	42.37
15	0.194	70.8	29.2
20	0.232	84.63	15.37
25	0.247	90.1	9.9
30	0.252	91.9	8.1
60	-	-	-

Table-3: Dissolution profile for T1 formulation of Carvedilol.

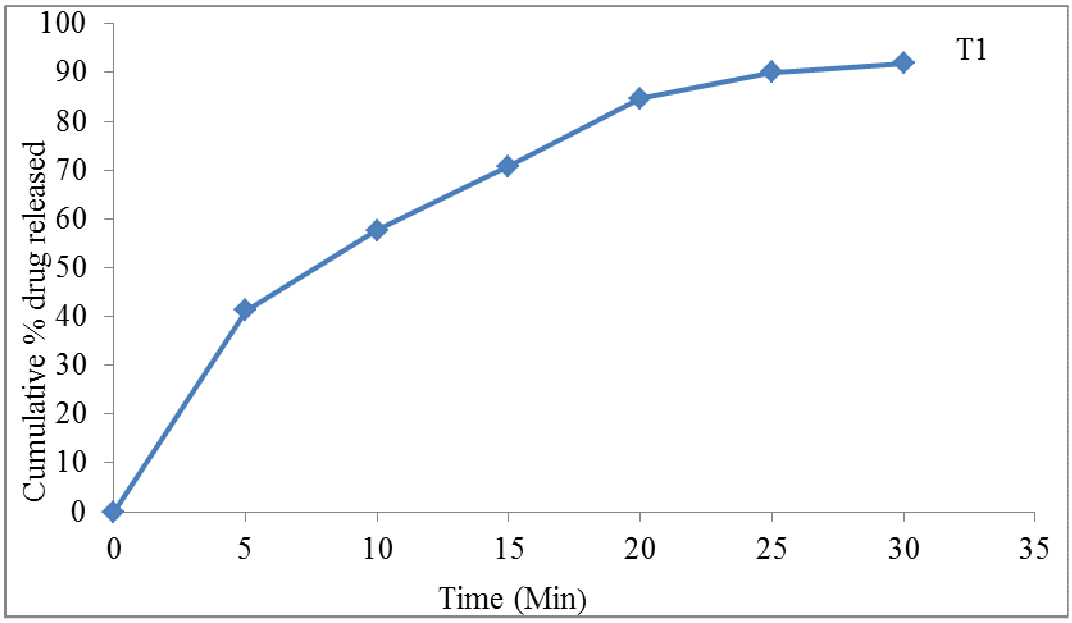

Fig. 1: Graph showing the cumulative drug release from the formulation T1 of the Carvedilol.

(ii) The release study from the T2 formulation as shown in Table 4 and Fig.2.

Table-4: Dissolution profile for T2 formulation of Carvedilol.

TIME (MIN)	ABSORBANCE	CUMULATIVE % DRUG RELEASED	%REMAINING TO BE RELEASED
5	0.126	45.9	54.1
10	0.163	59.4	40.5
15	0.210	76.6	23.4
20	0.241	87.9	12.1
25	0.251	91.5	8.5
30	0.268	97.8	2.2
60	-	-	-

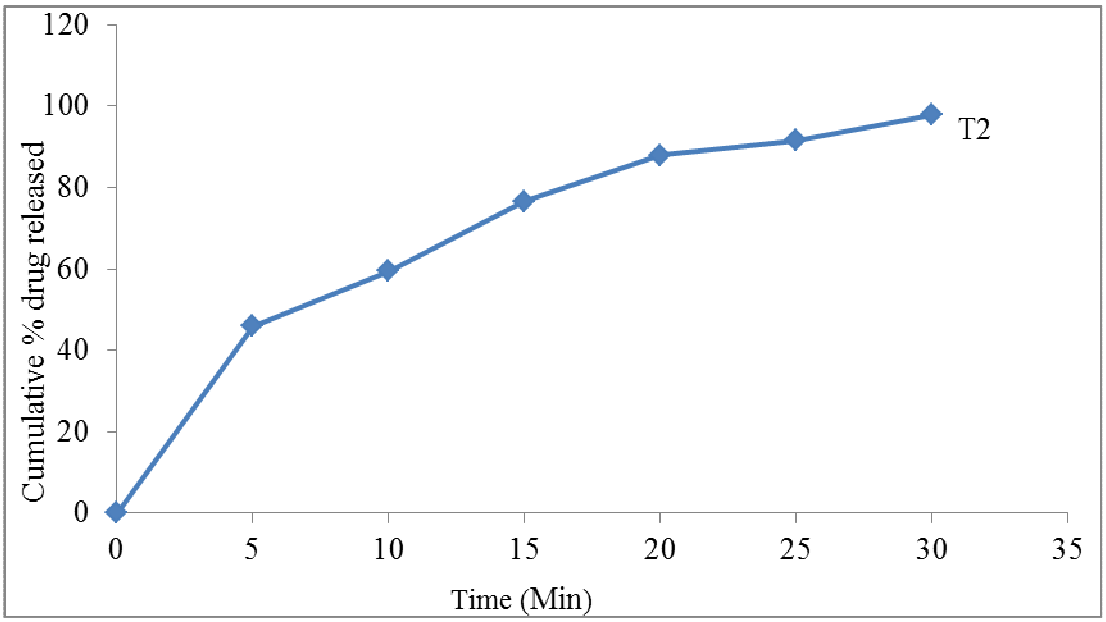

Fig. 2: Graph showing the cumulative drug release from the formulation T2 of the Carvedilol.

(iii)The release study from the T3 formulation is as shown in Table 5 and Fig. 3.

Table-5: Dissolution profile for T3 formulation of Carvedilol.

TIME (MIN)	ABSORBANCE	CUMULATIVE % DRUG RELEASED	%REMAINING TO BE RELEASED
5	0.142	51.8	48.2
10	0.198	72	28
15	0.224	81.7	18.3
20	0.251	91.5	8.5
25	0.264	96.3	3.7
30	-	-	-
60	-	-	-

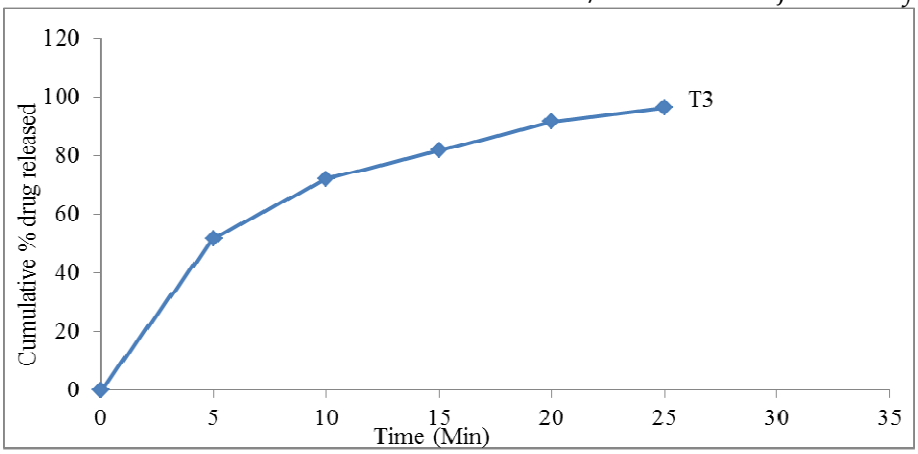

Fig. 3: Graph showing the cumulative drug release from the formulation T3 of the Carvedilol.

(iv)The release study from T4 formulation is as shown in Table 6 and Fig. 4.

Table-6: Dissolution profile for T4 formulation of Carvedilol.

TIME (MIN)	ABSORBANCE	CUMULATIVE % DRUG RELEASED	%REMAINING TO BE RELEASED
5	0.160	58.36	41.4
10	0.208	75.9	24.1
15	0.238	86.8	13.1
20	0.267	97.43	2.57
25	-	-	-
30	-	-	-
60	-	-	-

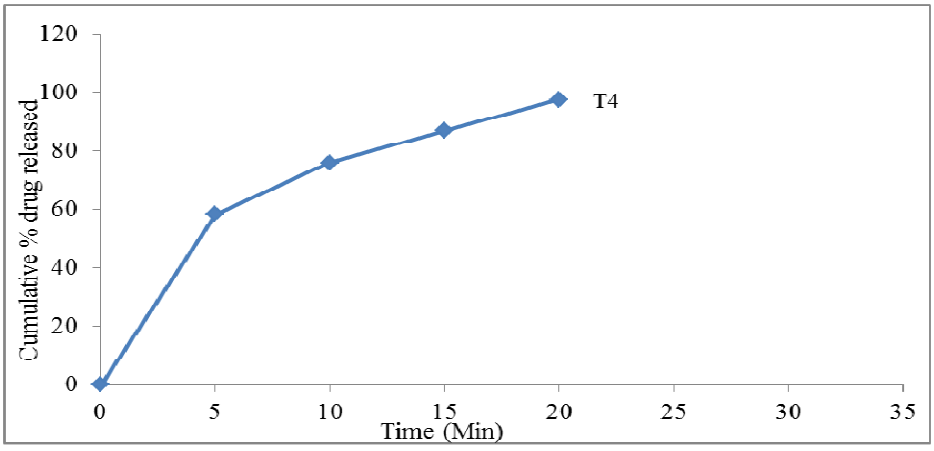

Fig. 4: Graph showing the cumulative drug release from the formulation T4 of the Carvedilol.

Table-7: Comparative dissolution profiles of T_1, T_2, T_3, T_4 formulations of Carvedilol.

Time(min)	T1	T2	T3	T4
5	41.2	45.9	51.8	58.36
10	57.63	59.43	72	75.9
15	70.8	76.6	81.7	86.83
20	84.63	87.9	91.5	97.43
25	90.1	91.5	96.3	-
30	91.9	97.8	-	-
60	-	-	-	-

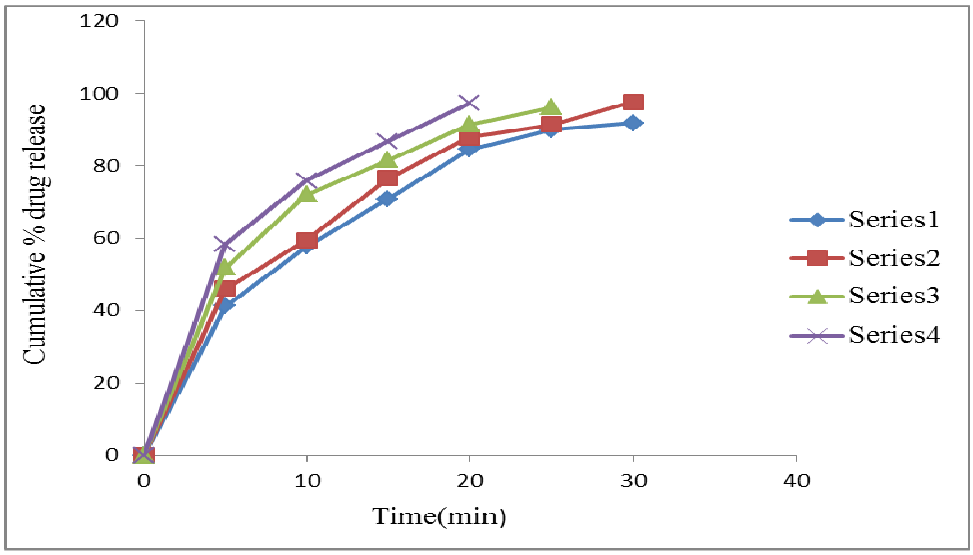

Fig.5: Comparative dissolution profiles of T_1, T_2, T_3, T_4 formulations of Carvedilol.

The method selected for the preparation of fast dissolving tablets of Carvedilol is by using super disintegrants (croscarmellose sodium) [7].

In the formulation of Carvedilol, initially maize starch (15%) and super disintegrant (5%) were added to the formulation by wet granulation techniques. Results showed that 91.9% was released in 30 min in formulation containing 15% maize starch (T_1) and 97.8% was released in 30min from the formulation containing super disintegrant (T_2). In formulation3 the disintegrant and super disintegrant were added in the ratio of 3:1 and 96.3% was released in

25min. In formulation4 the disintegrant and super disintegrant were added in the ratio of 3:2 and 97.43% was released in 20 min. All these tablets showed required hardness, limited friability and good disintegration time (within I.P limits). All the formulations were evaluated for drug content[8] and results are given in the Table 3. The percentage drug content was in the range of 89 to 94%.

Conclusion

Quick dissolving tablets are a novel type of tablet dosage forms for oral administration. It is advantageous to have quick dissolving technique over solid and liquid dosage forms. Addition of Super disintegrant (croscarmellose sodium) to the formulation and the use of wet granulation method showed that there is decreased in disintegration time. (Table-2). Addition of Disintegrant (starch) to the formulation and the use of wet granulation method showed that there was an increase in disintegration time. (Table-2). Addition of Super disintegrant (croscarmellose sodium)[7,9] and Disintegrant (starch) to the formulation in 3:1 ratio and the use of wet granulation method showed that there is gradual decreased in disintegration time. (Table-2). Addition of Super disintegrant (croscarmellose sodium) and Disintegrant (starch) to the formulation in 3:2 ratio and the use of wet granulation method showed that there is more decreased in disintegration time. (Table-2). Drug release profile of fast dissolving tablets of carvedilol of formulations 1, 2, 3, 4 follows first order release pattern as shown in Fig.1 to 4.

The above discussed results clearly depicts that the useful of the FDT is, in the improvement of dissolution rate of poorly soluble drugs like carvedilol whose bioavailability and dissolution rates are limited. However further studies like Infrared spectrophotometric studies to know whether there are any interactions between drug and super disintegrant. Preparation of FDT by other approaches using different excipients, characterisation in term of its long term stability and in vivo absorption studies are necessary.

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Corresponding Author:

Sirisha.M[1]*,

Email: *chinnu_dgp@yahoo.com*