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Original Research Article

FORMULATION AND EVALUATON OF ORAL DISINTEGRATING TABLETS OF CETIRIZINE HYDROCHLORIDE

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ABSTRACT

Oral disintegrarion tablets of Cetirizine Hydrochloride were prepared by direct compression method using different super disintegrating agents such as Crosspovidone, Sodium starch glycolate and Crosscarmellose sodium. An optimized formulation F8(low hardness) was found, which provided short wetting time of 74sec and water absorption ratio of 16.24sec, *In-vitro* disintegration time of 55sec and *In-vitro* % drug release 98.75 in time of 15min. It indicated that the amount of Super disintegrant Cross carmellose sodium significantly affected the dependent variables like wetting time, water absorption ratio, *In-vitro* disintegration time and *In-vitro* dispersion time. The best *In-vitro* drug release was found to be in formulation F8 (hh) low hardness 98.75% drug release during the end of 15min.

Key Words: Cetirizine, Oral Disintegration tablets, Wetting time, Water absorption ratio, Lowhardness, Super disintegrants.

INTRODUCTION

Cetirizine Hydrochloride, which is an effective drug in the treatment of allergic conjunctivitis such as inflammation of eyes, allergies skin conditions like urticaria. The concept of Mouth Disintegrating Drug Delivery System emerged with an objective to improve patient's compliance[1-3]. These dosage forms rapidly disintegrate and dissolve to release the drug as soon as they come in contact with saliva, thus obviating the need for water during administration, an attribute that makes them highly attractive for pediatric and geriatric patients. Difficulty in swallowing conventional tablets and capsules is common among all age groups, especially in elderly and dysphagic patients [4-7]. The current process describes the specialized excipients and hardness was adjusted at two different hardness one is at low hardness 3-5 kg/cm^2 and one is at high hardness7-9 kg/cm^2 [8-10].

EXPERIMENTAL

Cetirizine Hydrochloride oral disintegration tablets were prepared by the direct compression method using different excipients. The excipients used were Micro crystalline cellulose, Mannitol, Cross carmellose sodium, Sodium starch glycolate. Compositions of various formulations are shown in Table 1. All the ingredients of the oral disintegration tablets of Cetirizine Hydrochloride were weighed and mixed in mortar with the help of pestle. Then the blended material was slightly compressed on 8mm flat–biconvex punch using a Rimek MINI PRESS-Karnavathi tablet machine. The total weight of the formulation was

maintained 450mg. The hardness was adjusted at two different hardness one is at low hardness 3-5 kg/cm^2 and one is at high hardness 7-9 kg/cm^2 .

Table.1.Formulations F1-F12 of Different Batches of Cetirizine Hydrochloride ODT Tablets At High Hardness (7-9N) and Low Hardness (3-5N)

Ingredients	Quantity/tablet (mg)											
	F1 LL	F2 LH	F3 HL	F4 HH	F5 LL	F6 LH	F7 HL	F8 HH	F9 LL	F10 LH	F11 HL	F12 HH
Cetirizine	5	5	5	5	5	5	5	5	5	5	5	5
CCS(H)	-	-	-	-	-	4.5	45	-	-	-	-	-
CCS(L)	-	-	-	-	4.5	-	-	45	-	-	-	-
SSG(H)	-	4.5	45	-	-	-	-	-	-	-	-	-
SSG(L)	4.5	-	-	45	-	-	-	-	-	-	-	-
PVPP(H)	-	-	-	-	-	-	-	-		4.5	45	
PVPP(L)									4.5	-	-	45
Mg Stearate(H)		6.75		6.75		6.75		6.75		6.75		6.75
Mg Stearate(L)	2.25		2.25		2.25		2.25		2.25		2.25	
Avicel	368.25	363.75	327.75	323.25	368.25	363.75	327.75	323.25	368.25	363.75	327.75	323.25
Sodium saccharin	5	5	5	5	5	5	5	5	5	5	5	5
Mannitol	60	60	60	60	60	60	60	60	60	60	60	60
Peppermint oil	5	5	5	5	5	5	5	5	5	5	5	5
Total weight	450	450	450	450	450	450	450	450	450	450	450	450

Table.2.Preformulation studies of Formulations F1 to F12

Formulation code	Angle of repose(θ)	Bulk density(g/cc)	Tapped density(g/cc)	Carr's index (%)	Hausner ratio (%)
F1	22.38±0.27	0.505±0.02	0.661±0.02	23.60±0.51	1.30±0.37
F2	24.26±0.31	0.478±0.04	0.6±0.01	20.33±0.39	1.25±0.29
F3	19.68±0.45	0.483±0.01	0.63±0.06	23.69±0.89	1.31±0.16
F4	20.04±0.26	0.489±0.06	0.576±0.04	15.14±0.26	1.17±0.48
F5	20.67±0.36	0.511±0.08	0.594±0.03	14.26±0.49	1.16±0.18
F6	24.37±0.29	O,511±0.05	0.616±0.08	17.04±0.76	1.20±0.51
F7	23.87±0.56	0.505±0.03	0.592±0.09	14.69±0.59	1.17±0.49
F8	21.56±0.89	0.494±0.04	0.592±0.07	16.55±0.26	1.19±0.76
F9	24.34±0.83	0.517±0.08	0.633±0.06	18.32±0.47	1.22±0.81
F10	22.92±0.76	0.468±0.03	0.659±0.01	20.94±0.37	1.26±0.34
F11	23.46±0.27	0.5±0.06	0.596±0.06	19.2±0.16	1.19±0.47
F12	21.11±0.36	0.529±0.02	0.616±0.03	14.12±0.41	1.16±0.82

POST – COMPRESSION STUDIES

Table.3.Weight variation, Hardness, Thickness, Friability ODT of Cetirizine Hydrochloride of formulations F1 to F12 at high hardness

Formulation code	Weight Variation(mg)	Hardness (Kg/Cm²)	Thickness (mm)	Friability (%)
F1	450± 1.216	7.8±0.114	3.0±0.046	0.64±0.19
F2	449± 2.215	8.0±0.117	3.0±0.053	0.33±0.26
F3	447± 0.115	7.6±0.236	3.1±0.047	0.68±0.67
F4	452± 1.157	8.4±0.115	3.2±0.086	0.21±0.47
F5	448± 2.163	8.6±0.118	3.1±0.039	0.45±0.37
F6	451± 3.125	7.3±0.116	3.0±0.014	0.38±0.84
F7	449± 0.117	8.0±0.214	3.0±0.059	0.47±0.23
F8	448± 1.119	9.2±0.119	3.2±0.048	0.39±0.53
F9	451± 2.146	9.0±0.123	3.0±0.018	0.61±0.1
F10	449± 1.128	8.5±0.112	3.0±0.056	0.38±0.62
F11	450± 0.235	7.9±0.123	3.1±0.029	0.55±0.56
F12	450± 1.358	8.2±0.132	5.1±0.026	0.39±0.27

Table.4.Post compression parameters of formulations F1 to F12 at low hardness

Formulation code	Weight vaiation(mg)	Hardness (kg/ cm²)	Thickness (mm)	Friability (%)
F1	450± 1.125	3.2±0.125	5.0±0.042	0.67±0.62
F2	452± 1.231	3.8±0.316	5.2±0.012	0.34±0.23
F3	448± 2.114	4.0±0.486	5.1±0.035	0.67±0.32
F4	449± 2.189	3.6±0.156	5.0±0.086	0.62±0.16
F5	448± 3.112	4.2±0.113	5.0±0.013	0.55±0.82
F6	450± 0.836	5.0±0.118	5.1±0.075	0.32±0.93
F7	449± 1.159	4.3±0.231	5.0±0.032	0.42±0.43
F8	447± 1.484	3.0±0.451	5.2±0.018	0.48±0.34
F9	448± 2.351	3.2±0.367	5.1±0.014	0.39±0.28
F10	449± 1.186	4.8±0.813	5.0±0.048	0.57±0.48
F11	449± 1.134	5.0±0.118	5.0±0.026	0.52±0.36
F12	451± 2.146	4.6±0.127	5.1±0.034	0.67±0.24

Table.5.Wetting time, Water absorption ratio, Disintegration time, *In- vitro* Dispersion Time and Drug content Assay of Cetirizine Hydrochloride oral disintegrating Tablets of formulations F1 to F12 at high hardness

Formulation code	Wetting time (sec)	Water absorption ratio	Disintegration time (sec)	In-vitro Dispersion Time (sec)	Drug content Assay (%)
F1	132±0.43	11.11±0.24	89±0.35	89±0.64	98±0.18
F2	111±0.62	11.55±0.63	84±0.74	91±0.71	97±0.78
F3	98±0.43	12.22±0.52	77±0.46	84±0.75	101±0.16
F4	92±0.58	10±0.64	69±0.14	86±0.92	92±0.34
F5	134±0.34	10.66±0.78	83±0.48	78±0.89	102±0.29
F6	121±0.12	13.33±0.28	87±0.54	86±0.28	96±0.87
F7	109±0.23	12.88±0.16	78±0.27	90±0.36	97±0.42
F8	102±0.75	14.6±0.12	74±0.62	72±0.15	93±0.58
F9	128±0.86	15.0±0.86	80±0.94	77±0.46	95±0.67
F10	117±0.64	13.71±0.24	79±0.28	69±0.37	87±0.34
F11	102±0.16	14.96±0.36	73±0.31	70±0.54	89±0.15
F12	95±0.34	13.68±0.51	66±0.42	64±0.41	86±0.65

Table .6.Wetting time, Water absorption ratio, Disintegration time, *In- vitro* Dispersion Time and Drug content Assay of ODT F1 to F12 at low hardness

Formulation Code	Wetting time (sec)	Water absorption ratio(sec)	Disintegration time (sec)	In-vitro Dispersion Time (sec)	Drug content Assay (%)
F1	129±0.35	16.1±0.24	86±0.51	77±0.37	99±0.46
F2	115±0.51	17.22±0.41	90±0.82	80±0.26	104±0.41
F3	97±0.37	15.1±0.35	77±0.64	66±0.15	102±0.37
F4	88±0.61	13.3±0.86	68±0.39	70±0.47	98±0.26
F5	127±0.18	16.88±0.93	110±0.47	81±0.34	103±0.18
F6	111±0.13	17.50±0.29	94±0.28	79±0.14	101±0.24
F7	76±0.54	18.20±0.63	75±0.32	64±0.24	98±0.48
F8	74±0.72	14.24±0.76	55±0.19	58±0.67	97±0.67
F9	123±0.94	12.77±0.54	90±0.21	73±0.28	102±0.41
F10	117±0.64	13.33±0.61	81±0.58	60±0.41	99±0.89
F11	102±0.58	14.78±0.13	79±0.94	71±0.43	98±0.64
F12	91±0.16	13.38±0.26	65±0.52	77±0.61	101±0.21

Table.7.*In - vitro* Dissolution profile of formulations F1 to F12 at High hardness

TIME (Min)	% Mean Drug Release											
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**
2	52.97	58.87	51.35	60.54	38.91	52.9	44.5	72.43	29.18	31.3	38.38	19.45
5	70.16	64.84	65.4.	66.48	50.27	62.1	51.3	80	47.02	50.2	63.78	43.78
10	77.29	81.08	84.32	78.37	64.59	91.3	56.2	90.27	57.29	65.9	76.36	74.59
15	83.24	94.29	96.29	85.94	88.10	94.5	81.2	95.91	71.35	81.0	77.29	87.02
30	100.2	101.4	100.7	102.3	103.6	101.6	102.3	102.1	101.1	101	102.4	100.3

Table.8.*In- vitro* Dissolution profile of formulations F1 to F12 at Low hardness

TIME (Min)	% Mean Drug Release											
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**
2	71.35	57.83	66.48	75.13	75.13	68.6	66.48	76.15	64.32	63.24	66.48	61.62
5	73.51	72.97	69.18	87.02	87.02	82.1	77.29	88.10	77.83	75.13	79.45	71.35
10	87.56	77.29	93.78	89.72	89.72	84.8	81.62	89.72	81.62	84.59	82.70	74.05
15	95.67	85.94	90.68	96.75	96.75	91.8	88.89	98.75	95.13	96.21	84.86	89.64
30	101.4	102.3	103.2	101.4	101.1	103.7	101	103.3	101.4	100.1	104.1	101.6

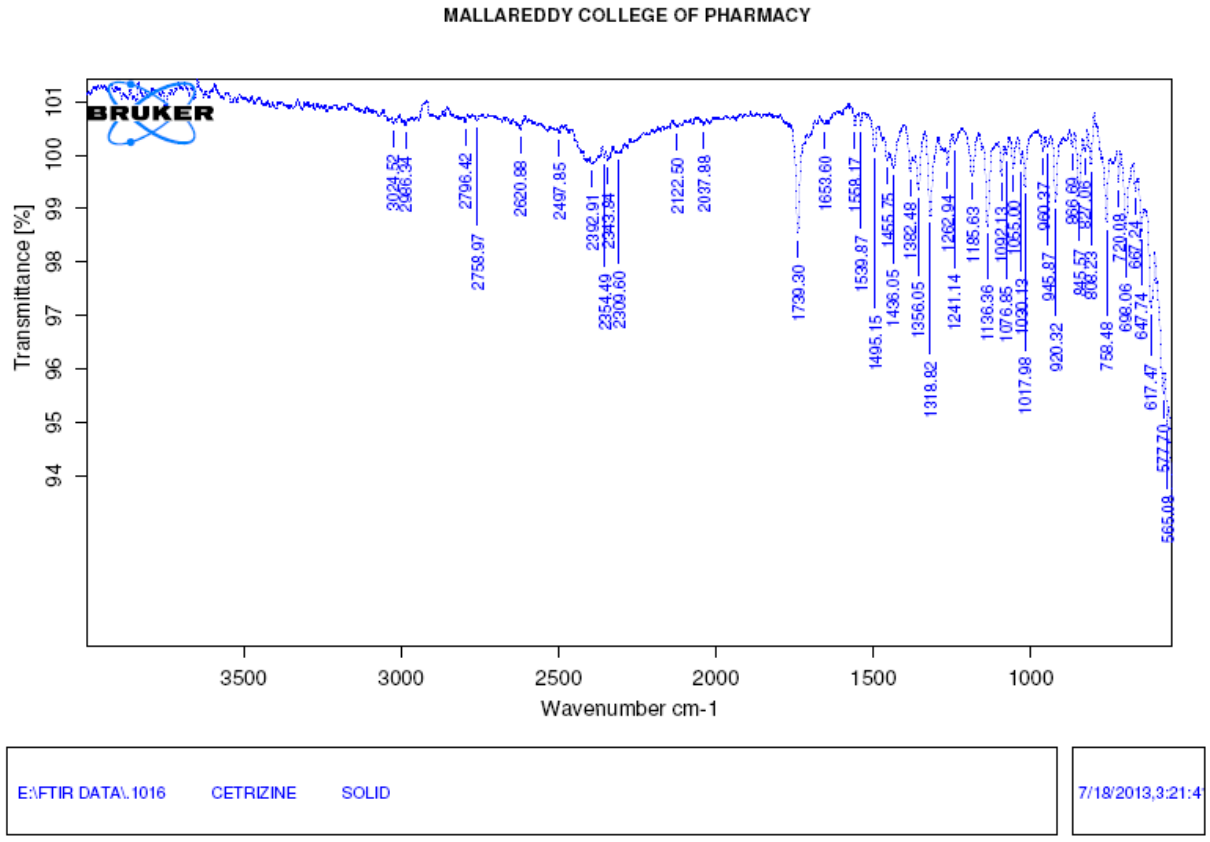

Fig.1.FT-IR Spectra of Pure Cetirizine Hydrochloride

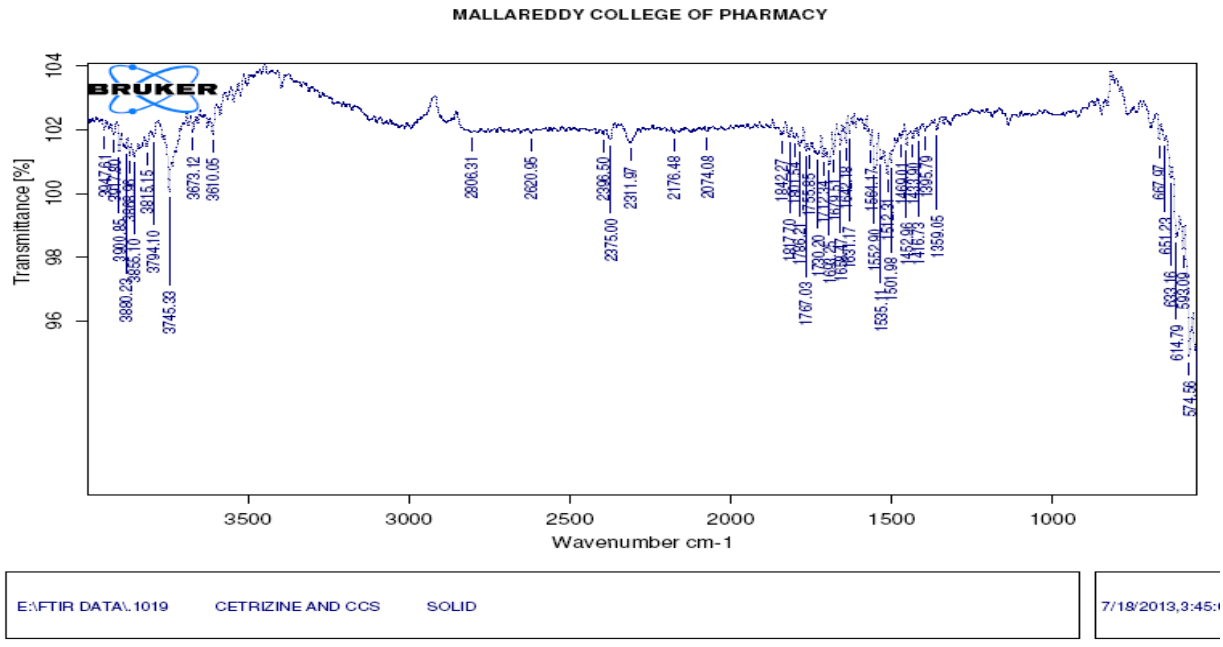

Fig.2.FT-IR Spectra of Physical Mixture of CCS & Cetirizine Hydrochloride

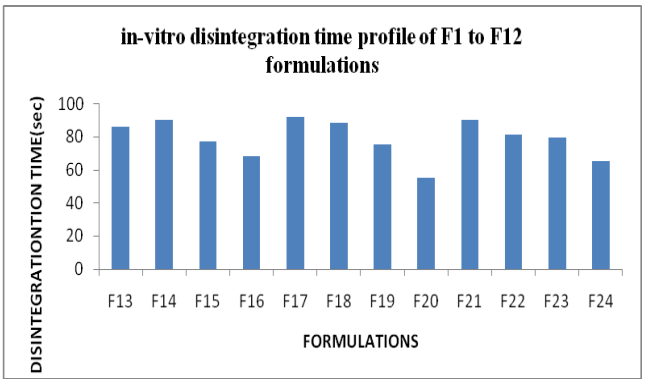

Fig.3.Disintegration Time profile of Cetirizine Hydrochloride Formulations F1 to F12 at high hardness

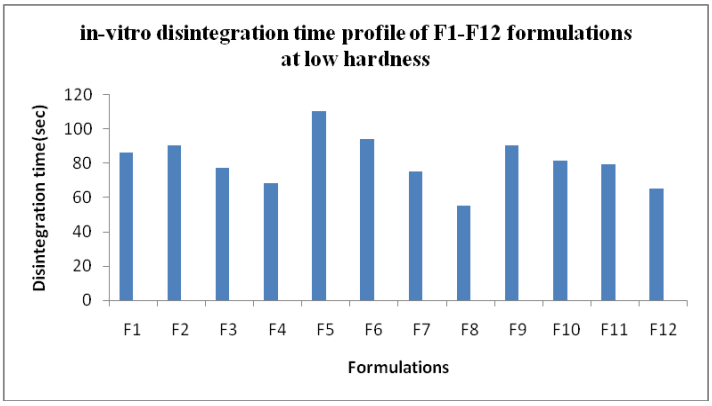

Fig.4.Disintegration Time profile of Cetirizine Hydrochloride Formulations F1 to F12 at low hardness

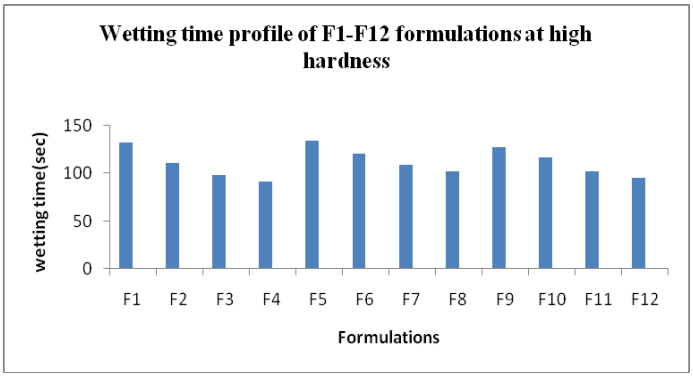

Fig.5.Wetting time profile of formulations F1-F12 at high hardness

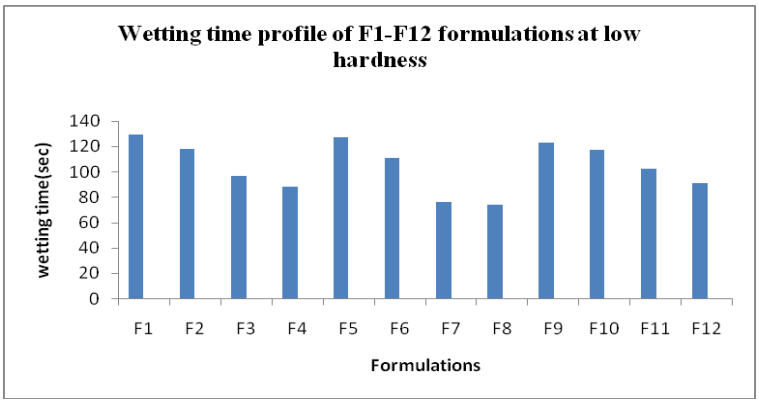

Fig.6.Wetting time profile of formulations F1-F12 at low hardness

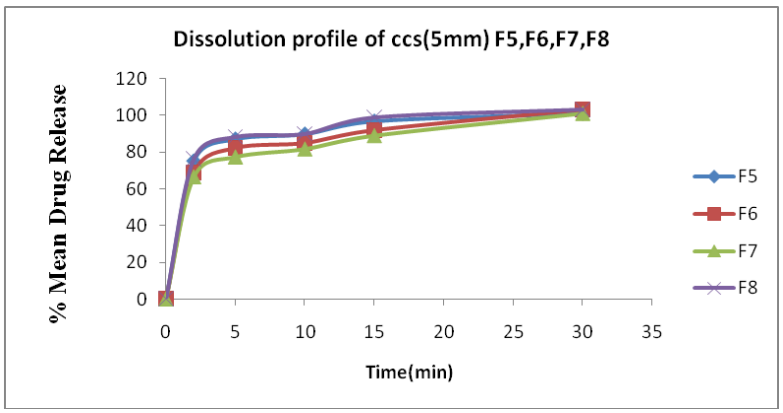

Fig.7.Dissolution Profile of Formulations F5 to F8 at low hardness

RESULTS AND DISCUSSION

The Oral disintegration tablets of F8 (low hardness) formulation contain 5mg of Cetirizine Hydrochloride, 323.25 mg of MCC and 60mg of mannitol (DC) and Cross carmellose sodium 45mg,(10%) Sodium saccharine 5mg, Magnesium stearate 6.75mg,(1.5%) Pippermint oil 5mg considered as the best formulation among all other formulations and it shown short wetting time (74sec) and in-vitro disintegration time (55sec) and maximum percentage of in-vitro drug release (98.75%) in 15 min. Formulations F8,(hh) low hardness can be considered as best formulations as oral disintegration tablet containing cetirizine Hydrochloride as the model drug. formulation F8 (low hardness) containing a single disintegrating agent along with mannitol DC as diluent and mg stearate as a lubricant may be considered as best formulation among the all 12 formulations.

The Preformulation parameters of all formulations F1-F12 are satisfactory and within the limits. Bulk density, Tapped density, Angle repose, %compressibility (or) Carr's index, Hausner ratio are within the limits.

CONCLUSION

Formulation F 8 (h h) at low hardness can be considered as the best formulation with short wetting time (74sec) and invitro disintegration time (55sec) and maximum percentage of drug release (98.75%) in 15 min is considered as the best formulation among all the 12 formulations.

CONFLICT OF INTEREST

The Authors declare no conflict of interest

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