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Formulation and Evaluation of Abacavir Sulphate Sustained Release Tablets

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Abstract

The main objective of the present study was to formulate once a daily dose of Abacavir Sulphate sustained release tablets by direct compression technique.. The polymers used to sustain the drug release are Guar Gum, Xanthum Gum, Eudragit L100. The compatibility studies between the drug and the polymer were studied using the FTIR spectroscopy and were found to be compatible. Preformulation parameters like, tapped density, bulk density, carr's index, Hausner's ratio, compressibility index, angle of repose are studied and the results were found to be within the limits. Using the above polymers formulations F1 to F9 were manufactured by direct compression technique and the tablets were evaluated for their thickness, hardness, friability, weight variation and content uniformity test.

Keywords: Abacavir Sulphate, tablets, Direct compression, Guar Gum, Xanthum Gum, Eudragit L100

Contents

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PAPER-QR CODE

1. Introduction

Oral drug delivery has been known for decades as the most widely used route of administration among all the routes that has been explored for the systemic delivery of drugs through various pharmaceutical products of different dosage form. In oral drug delivery conventional dosage forms are highly used from the past. However with the recognition of importance of extended release dosage form, greater attention has been focused in the development of timed release dosage forms. Conventional drug delivery systems includes immediate release dosage forms .In this, the drug release is immediate and the action remains for a short span of time. Hence it requires multiple doses to maintain constant plasma concentration[1].abacavir sulphate is ananti-viral drug used for the treatment of AIDS, Abacavir sulphate dose is up to 600 mg per day in single or divided doses.

2. Materials and Methods

Materials

Abacavir sulphate API supplied by Lantech pharmaceutical Pvt,Ltd, Hyderabad. Xanthum gum, supplied by cadila pharma, Ahmadabad, guar gum supplied by cadila pharma, Ahmadabad, Eudragid L 100 Supplied by Lara drugs Pvt Ltd, Micro crystalline cellulose was supplied by Brahmar Cellulose Pvt.Ltd. Cuddalore, Talk Supplied by BASF Laborataries-Hyderabad, Magnesium stearate Supplied by S.D. Fine chemicals, Mumbai.

Methods:

Preformulation Studies:

Bulk density[3]:

The bulk density was calculated by using the following formula.

$$\text{Bulk density} = \frac{\text{Weigh of powder}}{\text{Bulkvolume}} \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Tapped Density[3]:

The tapped density may be computed.

$$\text{Tapped density} = \frac{\text{Weight of powder}}{\text{Tapped volume}} \quad \ldots\ldots\ldots(2)$$

Carr's Index[3]:

The following equation is used to find the Carr's index

$$\text{CI} = \frac{\text{TD}-\text{BD}}{\text{TD}} \times 100 \quad \ldots\ldots\ldots\ldots\ldots(3)$$

TD = Tapped density,
BD = Bulk density

Hausner's Ratio:

It indicates the flow properties of the powder and ratio of Tapped density to the Bulk density of the powder or granule[3]

$$\text{Hausner's Ratio} = \frac{\text{Tappeddensity}}{\text{Bulkdensity}}$$

Formulation and Evaluation Studies:

Formulation Studies:

Manufacturing Process:

Direct Compression:

I. Sifting:

Abacavir was sifted through 20 mesh. Microcrystalline cellulose and other excipients were sifted through 40 mesh individually[2].

II. Dry mix:

The sifted material abacavir, Microcrystalline cellulose were taken in a large size polybag and mixed properly by tumbling action. Finally magnesium sterate was added and mixed for about 5 minutes, so that the surface was coated with lubricant evenly.

III. Compression:

The powder blend was compressed into tablets using round shaped punches to get tablets of 300 mg weight on a 16 station rotary tablet machine.

Table 1

Ingredients (mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9
Abacavir	300	300	300	300	300	300	300	300	300
X-Gum	125	150	_	_	_	_	125	125	_
G-Gum	_	_	125	150	_	_	125	_	125
Eudragit	_	_	_	_	125	150	_	125	125
Mcc	269	244	269	244	269	244	144	144	144
Talc	02	02	02	02	02	02	02	02	02
Mg. Sterae	04	04	04	04	04	04	04	04	04
Total	700	700	700	700	700	700	700	700	700

3. Results and Discussion

Preformulation Studies:

Micromeritic properties of different formulations of abacavirsulphate shown in below table

Formula-tion Code	Angle of Repose(Θ)	Bulk Density	Tapped Density	Carr' S Index	Hausner's Ratio
F1	26.1±0.16	0.55±0.045	0.63±0.07	13.1±0.6	1.15±0.04
F2	26.8±0.11	0.51±0.044	0.60±0.09	14.63±0.8	1.17±0.08
F3	25.0±0.13	0.51±0.045	0.60±0.04	14.6±0.1	1.17±0.06
F4	27.4±0.19	0.50±0.046	0.56±0.01	11.12±0.6	1.13±0.08
F5	29.0±0.19	0.47±0.042	0.58±0.04	14.96±0.7	1.17±0.09
F6	27.4±0.15	0.52±0.046	0.61±0.04	15.44±0.8	1.23±0.09
F7	27.9±0.14	0.51±0.042	0.63±0.08	13.47±0.8	1.15±0.04
F8	25.1±0.16	0.47±0.046	0.60±0.04	20.4±0.6	1.25±0.06
F9	25.3±0.19	0.43±0.043	0.61±0.04	20.5±0.6	1.23±0.08

Compatability Studies:

Preliminary Studies

S.No	Excipients	Ratio	Description	
			Initial	Final
1	Abacavir –API	_	White powder	white powder
2	API–G-Gum	1:1	Half white colored powder	half white colored powder
3	API–X-Gum	1:1	White colored powder	white colored powder
4	API–Eudragit	1:1	White colored powder	white colored powder
5	API–Mcc	1:1	Half white colored powder	half white colored powder
6	API-Talc	1:1	Half white colored powder	half white colored powder
7	API –Magnesium stearate	1:1	White colored powder	White colored powder

FTIR Spectrum

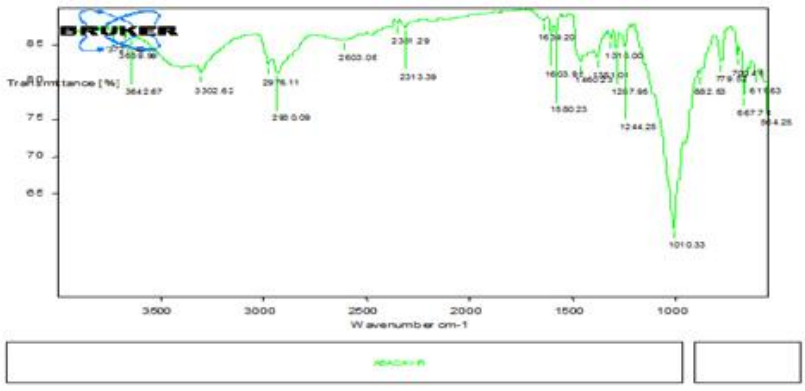

Figure 1: FTIR spectrum of abacavir sulphate

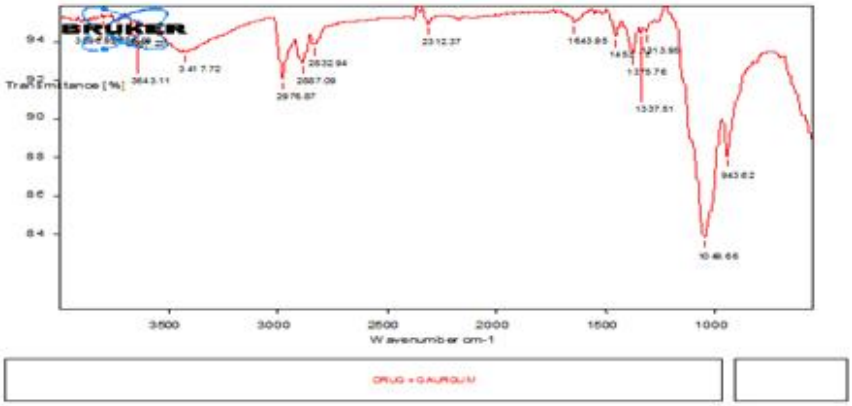

Figure 2: FTIR spectrum of Abacavir Sulphate+G-Gum

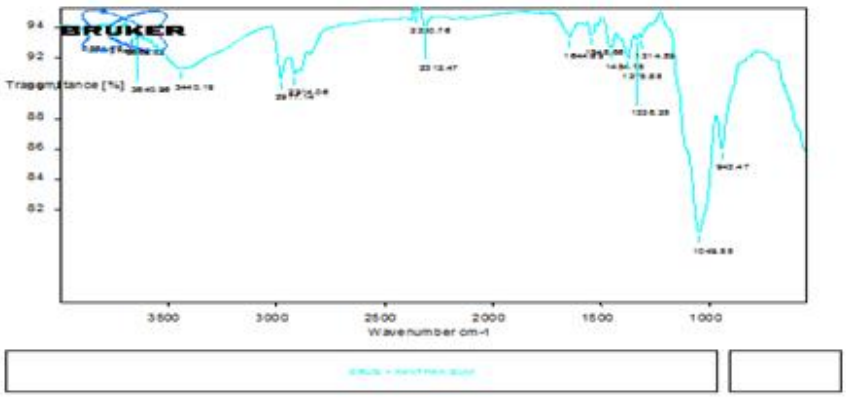

Figure 1: FTIR spectrum of abacavir Sulphate +X-Gum

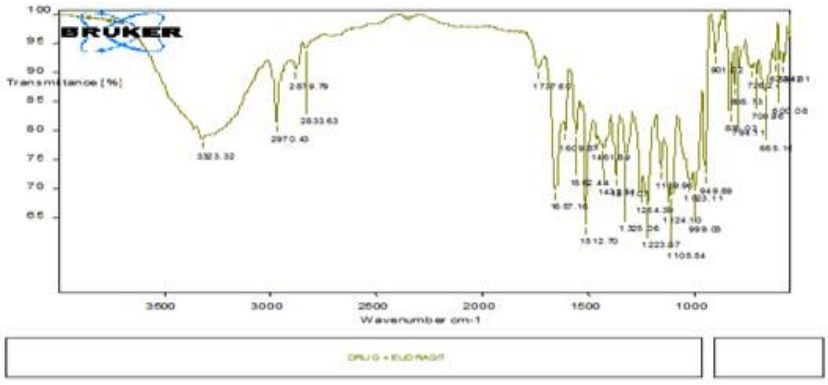

Figure 2: FTIR spectrum of Abacavir Sulphate + Eudragit

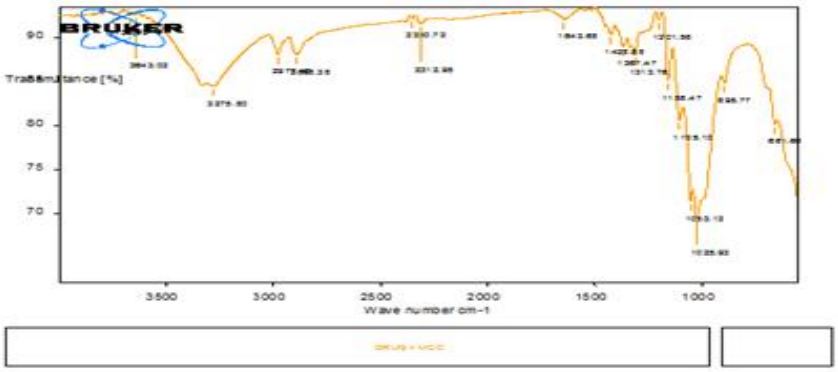

Figure 3: FTIR spectrum of Abacavir Sulphate + MCC

Table 2: Absorbances of Different Concentrations of Pure Drug

S.No	Conc. (µg/ml)	Absorbance(nm)
1	50	0.2917
2	75	0.4375
3	100	0.5833
4	125	0.7291
5	150	0.8753

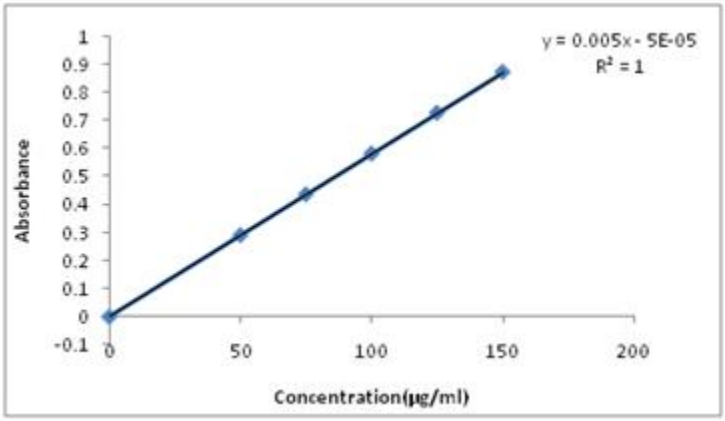

Figure 4: Calibration curve of active pharmaceutical ingredient in p^H 6.8 phosphate buffer

Evaluation of Formulated Tablts
Results of post compression parameters

Table 3: Physicochemical properties of abacavir tablets

Formulation Code	Weight Variation (mg)	Thicknes (mm)	Hardness (kg/cm2)	Friability (%)	Drug Content (%)
F1	703	5.82	14	0.1	97.5
F2	704	5.83	15	0.09	95.7
F3	700	5.82	17	0.06	93.4
F4	702	5.83	16	0.05	97.5
F5	703	5.82	15	0.03	99.1
F6	702	5.84	15	0.13	98.4
F7	701	5.85	16	0.06	98.4
F8	700	5.85	17	0.03	97.8
F9	701	5.81	16	0.15	99.3

Dissolution Studies
Percentage release profile of f1 to f9 formulatios

Table 4

Time (hrs)	% Drug Release								
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**
1	21.03	23.27	28.24	19.22	15.63	12.33	14.23	21.41	23.32
4	29.72	27.39	37.05	35.31	32.54	22.47	28.05	35.20	35.21
8	46.35	43.26	52.55	49.36	51.06	41.17	49.22	43.15	47.25
12	65.61	54.33	67.09	63.65	69.22	57.30	53.07	58.63	61.65
16	79.05	71.05	79.11	71.09	72.39	71.08	62.15	68.03	72.15
20	83.21	78.07	87.25	82.29	83.53	85.25	76.19	83.00	85.06
24	91.39	87.55	96.32	93.47	97.24	99.85	89.35	94.25	93.17

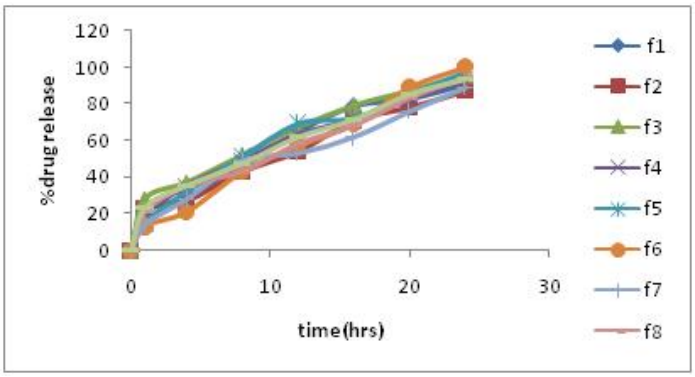

Figure 5

Results of release kinetics

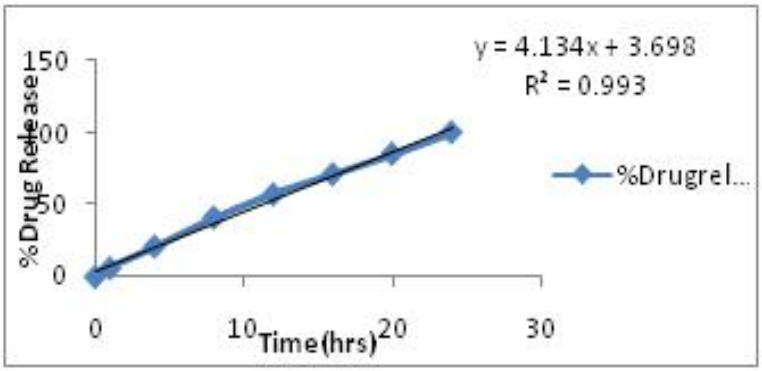

Figure 6: Plot Zero order of F6

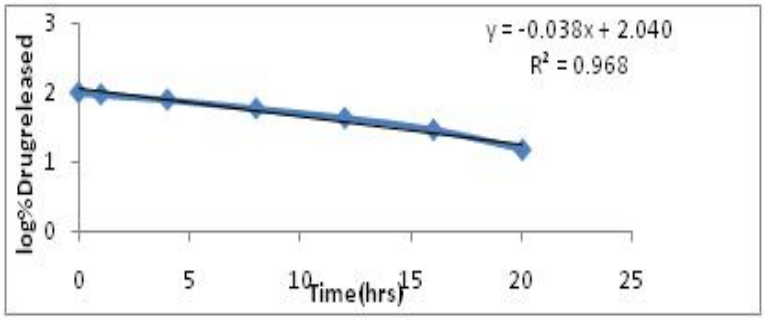

Figure 7: First order plot of F6

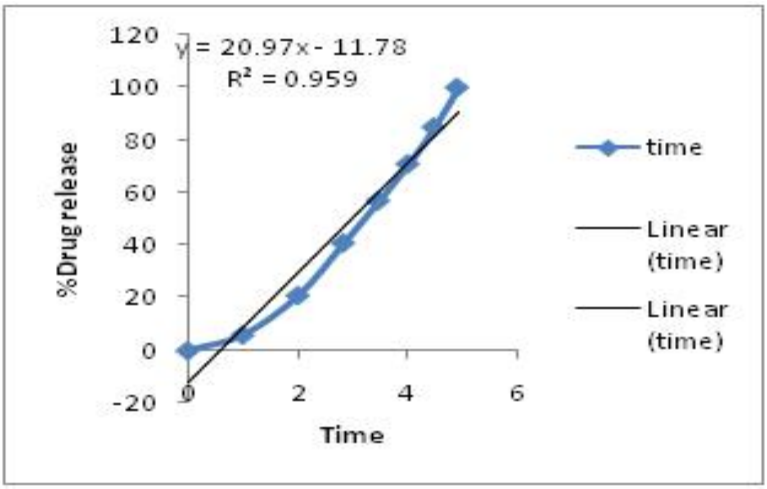

Figure 8: Higuchi plot of F6

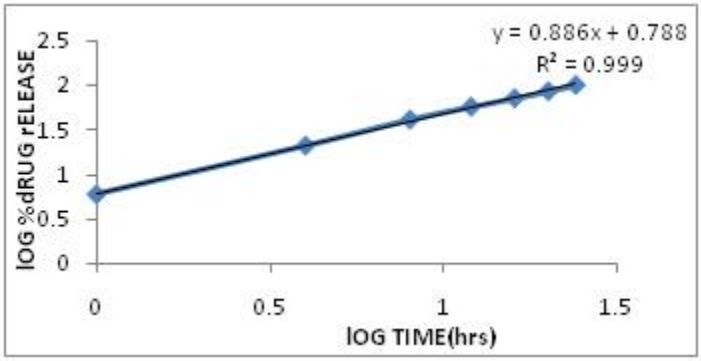

Figure 9: Koser Meyer's peppas plot of F6

Table 5: Data Analysis Results for Abacavir Sulphate in F6 Optimized Formulation

Zero Order	**First Order**	**Higuchi**	**korsemayerpeppas**	
r^2	r^2	r^2	r^2	N
0.993	0.968	0.959	0.999	0.683

Stability Data:

Table 6: Physio chemical parameters of Abacavir sulphate tablets of formulation f6 at 25°c/60% RH

Parameters	**Initial**	**After 1 month**	**After 2 months**	**After 3 months**
Description	White colored round shaped tablets	White colored round shaped tablets	White colored round shaped tablets	White colored round shaped tablets
Avg.weight (mg)	702.4	702.4	702.4	702.4
Hardness (kg/cm^2)	15.3	15.34	15.41	15.43
Thickness (mm)	5.84	5.84	5.84	5.84
Friability (%)	0.041	0.043	0.045	0.052

Table 7: Physio chemical parameters of Abacavirsulphate tablets of formulation f6 at 40°c /75% RH

Parameters	**Initial**	**After 1 month**	**After 2 months**	**After 3 months**
Description	White colored round shaped tablets	White colored round shaped tablets	White colored round shaped tablets	White colored round shaped tablets
Avg.weight (mg)	702.4	702.4	702.4	702.4
Hardness (kg/cm^2)	15	15.6	15.6	15.8
Thickness (mm)	5.82	5.82	5.82	5.82
Friability (%)	0.05	0.05	0.051	0.054

Table 8: Dissolution profiles of abacavirsulphate tablets from formulation f6 at 25°c/60% RH

Time Interval (HRS)	**Percentage of Drug Release**			
	Initial	**After1 month**	**After 2 months**	**After 3 months**
0	0	0	0	0
1	12	11	12	12
4	22	22	23	22
8	41	39	40	43
12	57	58	59	56
16	71	71	73	72
20	85	83	87	85
24	100	100	99	99

Table 9: Dissolution Profiles of Abacavir Sulphate Tablets from Formulation f6 at 40°c/75% RH

Time interval (hrs)	Percentage of drug release			
	Initial	After 1month	After 2 months	After 3 months
0	0	0	0	0
1	12	12	14	13
4	23	22	23	21
8	42	43	42	44
12	57	57	55	57
16	73	74	74	73
20	85	87	88	86
24	100	100	99	98

FTIR spectrum of F6 formulation:

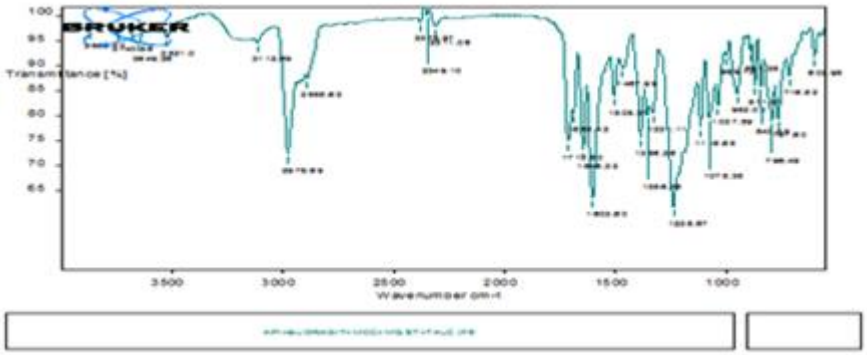

Figure 10: FTIR spectrum of F6 formulation

Abacavir Sulphate+Eudragit+Mcc+Mg.Sterate+Talc

4. Summary

The present investigation is focused on the development of once a daily dose of Abacavir sulphate sustained release tablets by using G-Gum, X-Gum, Eudragit L100 as rate controlling polymers. Nine formulation trials from f1 to f9 were formulated by using the above polymers.

5. Conclusion

Once a daily dose of abacavir sulphate sustained release tablets were formulated and evaluated. The results conclude that f6 formulation was best as it has minimum drug release initially (12.33%) and maximum drug release (99.85%) at the end of 24 hrs. Results of stability studies conclude that f6 formulation was stable. Hence in future in vitro-in vivo correlation studies can be carried out for further development of f6 formulation.

6. References

1. Theresa, M.Allen, Pieter R. Cullis, 2004; Drug Delivery Systems: Entering The Mainstream, Science, vol 303.1818-1821.
2. United States Pharmacopoeia, National Formulary , 1072-1073
3. Lachmen and Libermen,Industrial pharmacy vol –II.
4. Sunil Kumar, AnilKumar, 2012., Oral Extended Release Drug Delivery System: A Promising Approach, Asian J. Pharm. Tech.; Vol. 2: Issue 2, 38-43.
5. Yie W. Chein., Oral Drug Delivery System, Novel drug delivery Systems, 2nd Edition, vol 50, 139-157.
6. Ali Nokhodchi, ShaistaRaja,PryiaPatel,andKofi Asare-Addo, 2012., The Role of Oral Controlled Release Matrix Tablets in Drug Delivery Systems; Bioimpacts. 2(4): 175–187.
7. Vinay Kumar, PrajapatiSK, Mahendra Singh, 2012. Sustained Release Matrix Type Drug Delivery System: A Review; World Journal of Pharmacy and Pharmaceutical Sciences, Vol 1, Issue 3,934-960.
8. Shaista Raja, Kernet c, 2011. The Manufacturing Process, Techceuticals. Vol-11,2-11.
9. Dokala, PallaviCh, GouthamKumar, 2009. Direct Compression An Overview; International Journel of Research in Pharmaceutical and Biomedical Sciences; Vol. 4: issue 2229-3701, 155-158.
10. Mira Jivraj, Luigi G. Martini, 2000.,An summary of the dissimilar excipients helpful for the direct compression of tablets,Pharmaceutical Science & Technology Today,Vol 3, Issue 2, 58–63.

11. Marc H.V. Van Regenmortel, HIV An Overview, Journal of AIDS & Clinical Research, issn: 2155-6113, 73-85.
12. Pani, Nihar; Nath, Lila; Acharya, Sujata; Bhuniya, Biswanath, 2012, ournal of Thermal Analysis & Calorimetry; Vol. 108 Issue 1, 219.