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FORMULATION DEVELOPMENT AND OPTIMIZATION OF CONTROLLED RELEASE TABLETS OF ACECLOFENAC BY USING NATURAL POLYMERS AS RATE RETARDING AGENTS

D. Anusha*[1], I. Sindhu[1], M. Prem Kumar[1], A. Naveen Kumar[1], K. Gopi Naik[1], Nelapati Sailaja[1]

[1*]Department of Pharmaceutics, Vishwa Bharathi College of Pharmaceutical Sciences, Perecherla, Guntur, Andhra Pradesh, India.

ABSTRACT

The present study was aimed to design new oral controlled release matrix tablets of new NSAID Aceclofenac for once a day by using 10, 15, 20 and 25% of GG: HPMC and XG: HPMC mixture in the ratio 1:1 by wet granulation method. The prepared tablets subjected to in vitro drug release studies in pH 7.4 buffer solution. All the formulation meets the pre-compression and compression characteristics. All the tablets prepared with 10, 15, 20 and 25% of HPMC: XG mixture in the ratio 1:1 fails to meet the requirement of complete release of the drug in 24h. The tablet formulations containing 10% and 15% of GG: HPMC mixture fails to control release of drug upto 24h. The formulation AHG20 controlled release of drug upto 24h and released more than 97% of the drug in 24h. Hence considered as the best formulation. The optimized tablet batch formulations AHG20 showed no change in drug content or *in vitro* release pattern after storage at 40ºC/75% RH for 30 days. The FTIR studies indicated absence of interaction between aceclofenac and tablet excipients used in the matrix tablets. It has been observed from the above study that excipients like HPMC, xanthan gum, guar gum and microcrystalline cellulose were ideal excipients and effective for formulating controlled release matrix tablets. As these excipients are easily available, inexpensive and compatible. Controlled release matrix tablets provide several advantages reduce dose related toxicity, reduce drug waste and improve patient compliance.

KEYWORDS

Aceclofenac, Guar gum, Xanthan gum, CDDS and Matrix tablets.

Author for Correspondence:
Anusha D,
Department of Pharmaceutics,
Vishwa Bharathi College of Pharmaceutical Sciences,
Perecherla, Guntur, Andhra Pradesh, India.
Email: dr.sunilmekala@gmail.com

INTRODUCTION

Oral drug delivery is the most widely utilized route of administration and considered as most convenient, non-complicated and safe due to its ease of administration, patient acceptance, and cost-effective manufacturing process[1]. A sizable portion of orally administered dosage forms, so called

conventional, are designed to achieve maximal drug bioavailability by maximizing the rate and extent of absorption. Whilst such dosage forms have been useful, frequent daily administration is necessary, particularly when the drug has a short biological half life. This may result in wide fluctuation in peak and trough steady-state drug levels, which is undesirable for drugs with marginal therapeutic indices. Moreover, patient compliance is likely to be poor when patients need to take their medication three to four times daily on chronic basis. In order to overcome the drawbacks of conventional drug delivery systems, several technical advancements have led to the development of controlled drug delivery system. Controlled release drug delivery systems[2] are the drug delivery system that delivers the drug locally or systemically at a predetermined rate for a specified period of time. The controlled release drug delivery systems are aimed at controlling the rate of drug delivery, sustaining the duration of therapeutic activity and/or targeting the delivery of the drug to a tissue. Drug release from these systems should be at a desired rate, predictable and reproducible. Controlled drug delivery occurs when a polymer, whether natural or synthetic, is judiciously combined with a drug or other active agent in such a way that the active agent is released from the material in a predesigned manner. The release of the active agent may be constant over a long period, it may be cyclic over a long period, or it may be triggered by the environment or other external events. In any case, the purpose behind controlling the drug delivery is to achieve more effective therapies while eliminating the potential for both under and overdosing. These systems have gained importance because of the technological advances made in fabrication, which help to achieve zero order release rates of therapeutic moiety.

EXPERIMENTAL RESULTS AND DISCUSSION

The characteristics peaks confirmed the structure of Aceclofenac. The same peaks were also reported in all drug loaded matrix tablet. There were no change or shifting of the characteristic peaks in matrix tablets suggested that there was no significant drug polymer interaction which indicates the stable nature of the drug in all formulations.

Aceclofenac Controlled release tablets prepared with different concentrations of *Aeglemarmelos* gum

The gum isolated from *Aeglemarmelos* pulp and Micromeritic properties of formulation blend of Aceclofenac controlled release tablets prepared with different concentrations of *Aeglemaemelos* gum were shown in Table No.2. The results indicated that the gum have good flow property. The viscosity 1% W/V dispersion of *Aeglemaemelos* gum was shown in Table No.3. The results of the physical characterization of tablets are summarized in Table No.4. All the formulations hardness, weight variation, friability and drug content values were found to be within pharmacopoeia limits.

The results of *in vitro* drug release studies of different formulation were shown in Table No.5 and Figure No.2. Tablet formulations prepared by using drug and gum in ratios of 1:0.25, 1:0.5, 1:0.75 and 1:1 shown drug release for a period of 8.5 hours, 9 hours, 10.5 hours and 12 hours respectively. The initial burst release decrease with increase in concentration of gum. To ascertain the mechanism of drug release, the dissolution data was analyzed by zero order, first order, and Higuchi and Peppas equations. The correlation coefficient values (r) and dissolution kinetics values were shown in Table No.6. Amount of drug release versus time curves exhibited straight line for the formulations and confirmed that the release rate followed zero order release kinetics (Figure No.3). Log percentage of drug release versus log time curves shows linearity and proves that all the formulations followed peppas mechanism (Figure No.4).

Aceclofenac controlled release tablets prepared with different concentrations of *Cashew nut* tree gum

The gum isolated from *cashew nut* tree and micromeritic properties of formulation blend of Aceclofenac controlled release tablets prepared

with different concentrations of *Cashew nut* tree gum were shown in Table No.7. The results indicated that the gum have good flow property. The viscosity 1% W/V dispersion of *Cashew nut* tree gum was shown in Table No.8. Aceclofenac controlled release tablets with cashew nut tree gum were prepared by using different drug: gum ratios. The results of the physical characterization of tablets are summarized in Table No.9. All the formulations hardness, weight variation, friability and drug content values were found to be within pharmacopoeia limits

The results of *in vitro* drug release studies of different formulation were shown in Table No.10 and Figure No.5. Tablet formulations prepared by using drug and gum in ratios of 1:0.25, 1:0.5, 1:0.75 and 1:1 shown drug release for a period of 8 hours, 8.5 hours, 9.5 hours and 11 hours respectively. The initial burst release decrease with increase in concentration of gum. To ascertain the mechanism of drug release, the dissolution data was analyzed by zero order, first order, and Higuchi and Peppas equations. The correlation coefficient values (r) and dissolution kinetics values were shown in Table No.11. Amount of drug release versus time curves exhibited straight line for the formulations and confirmed that the release rate followed zero order release kinetics (Figure No.6). Log percentage of drug release versus log time curves shows linearity and proves that all the formulations followed peppas mechanism (Figure No.7).

Aceclofenac controlled release tablets prepared with different concentrations of *Moringaoleifera* gum

The gum isolated from *Moringaoleifera pulp* tree and micromeritic properties of formulation blend of Aceclofenac controlled release tablets prepared with different concentrations of *Moringaoleifera gum* shown in Table No.12. The viscosity 1% W/V dispersion of *Moringaoleifera* was shown in Table No.13. The swelling behavior of gum reveals it was suitable candidate for sustained release. Controlled release tablets of Aceclofenac was prepared with *Moringaoleifera* gum were prepared by using different drug: gum ratios. The results of the physical characterization of tablets are summarized in Table No.14. All the formulations hardness, weight variation, friability and drug content values were found to be within pharmacopoeia limits. The *Moringaoleifera gum* swells slowly and dissolves in presence of water.

Table No.1: Standard calibration curve values of Aceclofenac in 6.8 pH phosphate buffer

S.No	Concentration (µg/ml)	Absorbance ($\overline{X}$ ± S.D)
1	0	0.00
2	2	0.087
3	4	0.172
4	6	0.260
5	8	0.345
6	10	0.438

Table No.2: Micromeritic properties of formulation blend of Aceclofenac controlled release tablets prepared with different concentrations of *Aegle Marmelos* gum

Formulation code	Angle of repose	Bulk density	Tapped density	Compressibility index	Haussners ratio
F_1	26.94±0.021	0.276±0.014	0.314±0.013	12.10±0.024	1.137±0.012
F_2	25.6±0.031	0.350±0.012	0.408±0.011	14.21±0.022	1.161±0.014
F_3	25.42±0.052	0.320±0.020	0.370±0.009	11.89±0.009	1.134±0.017
F_4	26.85±0.024	0.319±0.005	0.362±0.021	11.87±0.017	1.130±0.024

Table No.3: Viscosity of 1% W/V dispersion of *Aeglemarmelos* gum

S.No	POLYMER	VISCOCITY (cps)
1	1% w/v of aeglemarmelos gum	2754.16

Table No.4: Physical properties of Aceclofenac Controlled release tablets formulated with different concentrations of *Aegle Marmelos* gum

S.No	Time (hrs)	F_1	F_2	F_3	F_4
1	0	0	0	0	0
2	0.5	6.29±0.12	5.91±0.16	5.15±0.16	3.86±0.32
3	1	14.33±0.16	11.28±0.19	8.60±0.19	7.07±0.21
4	1.5	20.51±0.15	15.91±0.14	13.23±0.18	11.68±0.23
5	2	25.94±0.19	22.10±0.19	18.25±0.17	16.32±0.24
6	2.5	30.65±0.11	27.56±0.16	23.31±0.24	19.84±0.16
7	3	35.39±0.23	32.02±0.15	28.77±0.26	24.90±0.19
8	3.5	42.45±0.25	38.19±0.16	34.27±0.25	27.71±0.18
9	4	46.87±0.12	42.50±0.25	38.26±0.21	32.81±0.16
10	4.5	52.46±0.23	48.20±0.21	43.05±0.16	37.56±0.20
11	5	58.85±0.24	54.54±0.20	47.47±0.15	41.96±0.16
12	5.5	64.50±0.26	59.03±0.23	52.30±0.23	45.62±0.25
13	6	70.56±0.25	66.21±0.24	55.64±0.21	49.30±0.21
14	6.5	75.52±0.23	71.14±0.16	62.03±0.21	54.14±0.16
15	7	82.02±0.26	74.95±0.16	66.18±0.23	57.09±0.19
16	7.5	86.27±0.25	82.21±0.25	71.87±0.15	62.36±0.19
17	8	92.45±0.13	87.22±0.26	75.68±0.16	65.74±0.16
18	8.5	99.90±0.16	92.50±0.25	80.28±0.23	70.66±0.15
19	9	-	99.87±0.10	85.28±0.24	75.61±0.16
20	9.5	-	-	89.54±0.21	79.82±0.19
21	10	-	-	94.97±0.23	83.29±0.18
22	10.5	-	-	99.28±0.13	86.40±0.23
23	11	-	-	-	91.781±0.26
24	11.5	-	-	-	97.53±0.20
25	12	-	-	-	99.64±0.18

Table No.5: *In vitro* release data of Aceclofenac Controlled release tablets prepared with different concentrations of *Aegle Marmelos* gum

Formulation Code	Hardness (kg/cm^2)	Weight variation (mg)	Friability (%)	Drug content (%)
F_1	4.7±0.021	251.32±0.24	0.40±0.010	100.14±0.13
F_2	4.5±0.025	250.65±0.28	0.34±0.018	99.78±0.15
F_3	4.8±0.032	249.83±0.39	0.45±0.024	99.56±0.11
F_4	4.6±0.038	250.12±0.45	0.61±0.036	100.15±0.38

Table No.6: *In vitro* drug release kinetic data of Aceclofenac controlled release tablets prepared with different concentrations of *Aegle Marmelos* gum

Formulation Code	Correlation Coefficient Values (R^2)				Dissolution Rate Constant (mg/hr) Ko	$t_{50\%}$	$T_{90\%}$	n Value
	Zero order	First order	Higuchi Model	Peppas Model				
F1	0.9992	0.8671	0.9324	0.9984	11.26±1.16	4.44	8	0.9513
F2	0.9995	0.8248	0.9246	0.9996	11.01±0.52	4.54	8.18	0.9837
F3	0.9998	0.8127	0.9225	0.9991	9.50±0.51	5.26	9.42	1.0043
F4	0.9997	0.7791	0.9176	0.9986	8.37±0.28	5.97	10.74	1.0797

Table No.7: Micromeritic properties of formulation blend of Aceclofenac controlled release tablets prepared with different concentrations of *cashew nut tree* gum

S.No	Formulation code	Evaluation parameters				
		Bulk density (g/ml)	Tapped density (g/ml)	Compressibility index (%)	Hausner's Ratio	Angle of Repose (θ)
1	F_5	0.439 ± 0.018	0.512±0.026	14.24 ± 0.71	1.16 ± 0.011	24.02 ± 0.22
2	F_6	0.445 ± 0.011	0.522±0.019	13.94 ± 0.52	1.17 ± 0.08	25.22 ± 0.16
3	F_7	0.478 ± 0.017	0.580±0.023	17.58 ± 0.45	1.21 ± 0.010	27.36 ± 0.15
4	F_8	0.496 ± 0.015	0.594±0.020	16.49 ± 0.56	1.19 ± 0.14	28.85 ± 0.18

Table No.8: Viscosity of 1% W/V dispersion of *Cashew nut tree* gum

S.No	Polymer	Viscocity (cps)
1	1% w/v of *Cashew nut* tree gum	2186.29

Table No.9: Physical properties of Aceclofenac controlled release tablets prepared with different concentrations of *cashew nut* tree gum

S.No	Formulation code	Parameters			
		Weight variation (mg)	Hardness (kg/cm^2)	Friability (%)	Drug content (%)
1	F_5	250 ± 1	4.3 ± 0.02	0.31	99.56
2	F_6	250 ± 3	4.0 ± 0.01	0.48	99.34
3	F_7	250 ± 2	4.2 ± 0.03	0.54	99.47
4	F_8	250 ± 1	4.1 ± 0.01	0.67	100.02

Table No.10: *In vitro* release data of Aceclofenac controlled release tablets prepared with different concentrations of *cashew nut* tree gum

S.No	Time (hrs)	F_5	F_6	F_7	F_8
1	0	0	0	0	0
2	0.5	10.26±0.11	7.01±0.15	6.46±0.08	4.02±0.14
3	1	15.48±0.13	12.74±0.14	10.57±0.15	9.2±0.08
4	1.5	21.8±0.09	18.51±0.08	14.97±0.09	13.86±0.15
5	2	28.16±0.15	24.04±0.14	19.67±0.08	19.1±0.15
6	2.5	34.02±0.12	29.3±0.15	24.39±0.12	22.73±0.09
7	3	39.9±0.06	35.19±0.12	29.68±0.15	28.28±0.13
8	3.5	45.28±0.08	40.81±0.09	37.44±0.12	32.78±0.14
9	4	51.22±0.14	46.19±0.12	42.53±0.08	37.03±0.15
10	4.5	56.39±0.15	51.87±0.14	47.64±0.15	41.3±0.12
11	5	61.58±0.09	57.03±0.13	51.97±0.09	45.59±0.14
12	5.5	68.42±0.14	64.13±0.15	57.14±0.08	49.91±0.15
13	6	73.95±0.08	69.36±0.08	61.52±0.15	54.25±0.12
14	6.5	79.77±0.15	75.16±0.14	66.46±0.12	58.6±0.14
15	7	85.63±0.12	80.99±0.09	70.89±0.15	63±0.11
16	7.5	92.87±0.15	88.58±0.08	75.88±0.09	67.41±0.12
17	8	99.33±0.08	93.28±0.12	81.17±0.08	71.84±0.14
18	8.5		99.29±0.15	87.03±0.09	76.29±0.13
19	9			93.73±0.15	81.85±0.08
20	9.5			99.19±0.14	85.27±0.15
21	10				89.79±0.12
22	10.5				94.33±0.14
23	11				99.71±0.15

Table No.11: *In vitro* drug release kinetic data of Aceclofenac controlled release tablets prepared with different concentrations of *cashew nut* tree gum

S.No	Formulation code	Correlation coefficient Values (R^2)				Dissolution Rate Constant (mg/hr) Ko	$t_{50\%}$	$t_{90\%}$	n Value
		Zero order	First order	Higuchi	Peppas				
1	F_5	0.9976	0.7964	0.9404	0.9975	0.8418	12.5	4.0	7.2
2	F_6	0.9998	0.8044	0.9268	0.9995	0.9427	11.62	4.3	7.8
3	F_7	0.9994	0.8068	0.9228	0.9928	1.0301	10.20	4.9	8.7
4	F_8	0.9998	0.7640	0.9261	0.9993	1.1035	9.09	5.5	10.0

Table No.12: Micromeritic properties of Aceclofenac controlled release tablets formulated with different concentrations of *Moringaoleifera* gum

S.No	Formulation code	Evaluation parameters				
		Bulk density (g/ml)	Tapped density (g/ml)	Compressibility index (%)	Hausner's Ratio	Angle of Repose (θ)
1	F_9	0.426±0.016	0.502±0.021	15.13 ±0.57	1.17±0.010	23.12 ± 0.18
2	F_{10}	0.452±0.019	0.543±0.023	16.75 ± 0.53	1.20 0.012	27.46 ± 0.15
3	F_{11}	0.469±0.021	0.571±0.022	17.86 ±0.46	1.19 ± 0.013	28.12±0.0.12
4	F_{12}	0.478±0.023	0.580±0.018	17.58 ±0.49	1.21 ±0.09	29.30 ± 0.18

Table No.13: Viscosity of 1% W/V dispersion of *Moringaoleifera* gum

S.No	Polymer	Viscosity (cps)
1	1% w/v of *Moringaoleifera* gum	1546.95

Table No.14: Physical properties of Aceclofenac controlled release tablets formulated with different concentrations *of Moringaoleifera* gum

S.No	Formulation code	Parameters			
		Weight variation (mg)	Hardness (kg/cm^2)	Friability (%)	Drug content (%)
1	F_9	250 ± 2	4.3 ± 0.04	0.51	99.36
2	F_{10}	250 ± 1	4.1 ± 0.02	0.63	100.01
3	F_{11}	250 ± 3	4.4 ± 0.03	0.73	99.42
4	F_{12}	250 ± 2	4.5 ± 0.02	0.82	99.17

Table No.15: *In vitro* release data of Aceclofenac controlled release tablets prepared with different concentrations of *Moringaoleifera* gum

S.No	Time (hrs)	F_9	F_{10}	F_{11}	F_{12}
1	0	0	0	0	0
2	0.5	6.67±0.12	5.53±0.16	4.76±0.12	3.86±0.15
3	1	13.19±0.23	9.75±0.23	8.22±0.32	5.92±0.16
4	1.5	17.83±0.36	14.32±0.35	13.22±0.21	11.27±0.13
5	2	20.98±0.21	18.73±0.25	17.11±0.26	15.52±0.19
6	2.5	26.81±0.25	26.37±0.16	22.15±0.16	18.06±0.17
7	3	33.82±0.29	31.09±0.32	27.23±0.19	24.85±0.22
8	3.5	39.34±0.25	35.45±0.34	33.86±0.11	27.69±0.21
9	4	46.42±0.35	44.41±0.26	38.24±0.21	33.55±0.13
10	4.5	54.29±0.15	46.94±0.12	45.69±0.22	39.07±0.26
11	5	67.93±0.39	53.68±0.29	49.75±0.26	44.62±0.26
12	5.5	75.54±0.18	61.59±0.25	54.59±0.23	49.82±0.25
13	6	80.14±0.28	65.74±0.15	61.75±0.21	53.90±0.22
14	6.5	88.2±0.16	73.71±0.26	66.27±0.12	58.76±0.21
15	7	90.58±0.35	77.92±0.25	71.58±0.16	64.80±0.19
16	7.5	93.73±0.26	84.82±0.26	77.30±0.19	70.86±0.15
17	8	99.28±0.25	93.28±0.15	84.96±0.16	75.82±0.32
18	8.5	-	99.59±0.36	93.04±0.23	81.18±0.14
19	9	-	-	99.11±0.24	87.33±0.23
20	9.5	-	-	-	94.65±0.32
21	10	-	-	-	99.97±0.11

Table No.16: *In vitro* drug release kinetic data of Aceclofenac controlled release tablets prepared with *Moringaoleifera* gum

S.No	Formulation Code	Correlation Coefficient Values (R^2)				Dissolution Rate Constant (mg/hr) Ko	$t_{50\%}$	$T_{90\%}$	N Value
		Zero Order	First Order	Higuchi Model	Peppas Model				
1	F_9	0.9932	0.8964	0.9058	0.9941	12.95	3.86	6.94	1.0157
2	F_{10}	0.9973	0.8474	0.9043	0.9978	11.52	4.34	7.82	1.0508
3	F_{11}	0.9961	0.8238	0.8979	0.9983	10.50	4.76	8.57	1.0817
4	F_{12}	0.9946	0.7977	0.8909	0.9993	9.76	5.12	9.23	1.1864

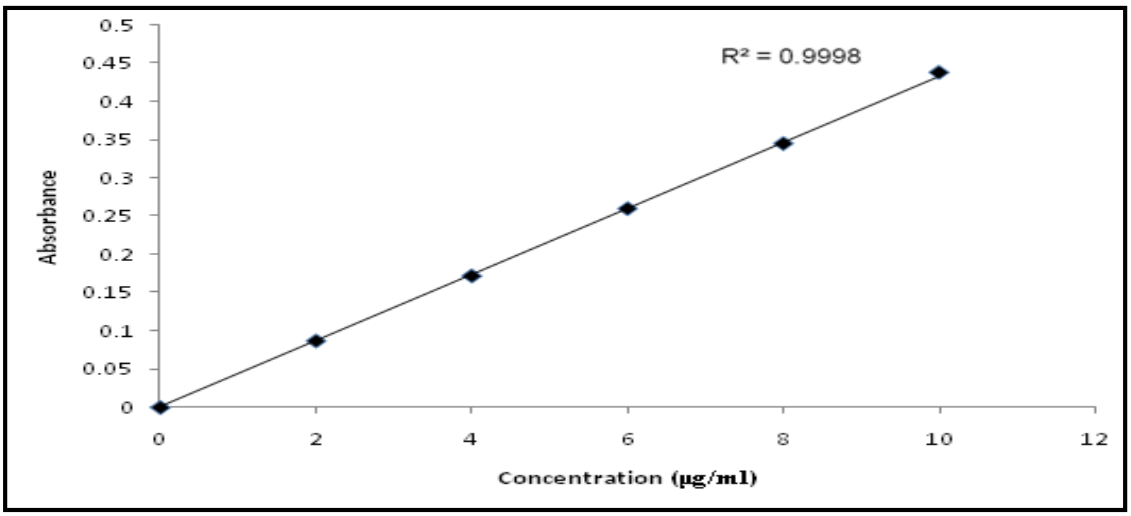

Figure No.1: Calibration curve of Aceclofenac in 6.8 pH phosphate buffer

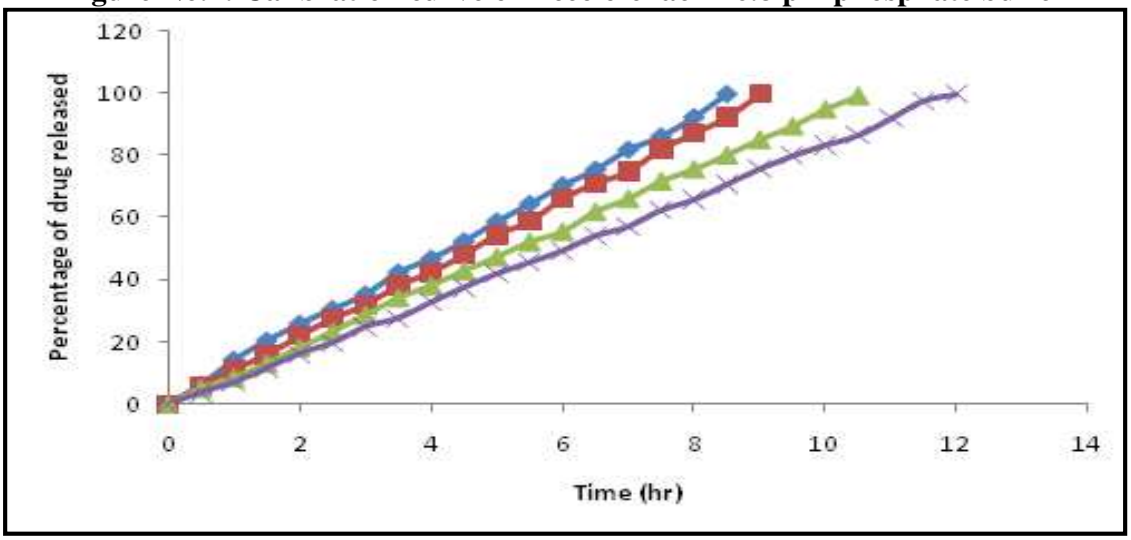

Figure No.2: Comparative *in-vitro* drug release profile of Aceclofenac Controlled release tablets prepared with different concentrations of *Aegle Marmelos* gum

(-■-) F_1 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.25 ratio
(-♦-)F_2 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.5 ratio
(-▲-) F_3 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.75 ratio
(-×-) F_4 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:1 ratio

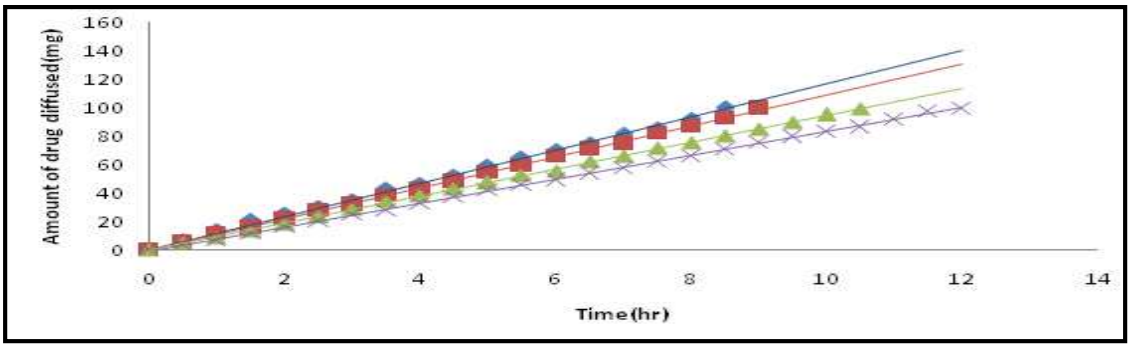

Figure No.3: Comparative Zero order plots of Aceclofenac Controlled release tablets prepared with different concentrations of *Aegle Marmelos* gum

(-■-) F_1 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.25 ratio
(-♦-)F_2 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.5 ratio
(-▲-) F_3 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.75 ratio
(-×-)F_4 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:1 ratio

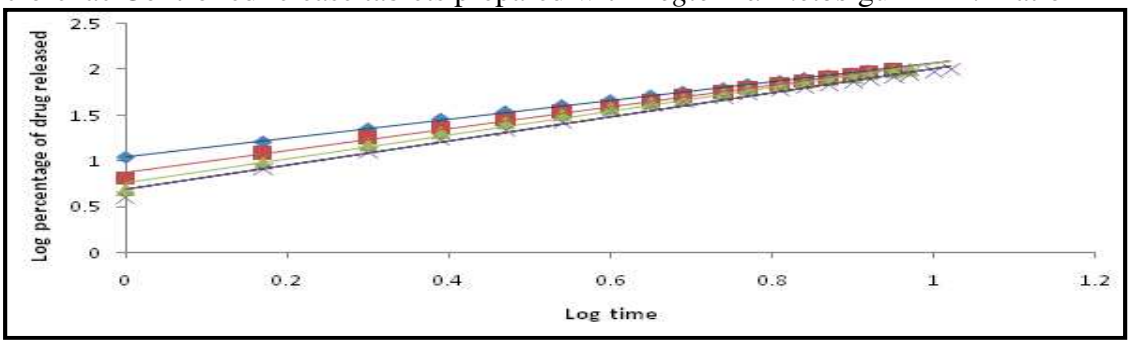

Figure No.4: Comparative peppas plots of Aceclofenac Controlled release tablets prepared with different concentrations of *Aegle Marmelos* gum

(-■-) F_1 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.25 ratio
(-♦-) F_2 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.5 ratio
(-▲-) F_3 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:0.75 ratio
(-×-) F_4 - Aceclofenac Controlled release tablets prepared with *Aegle Marmelos* gum in 1:1 ratio

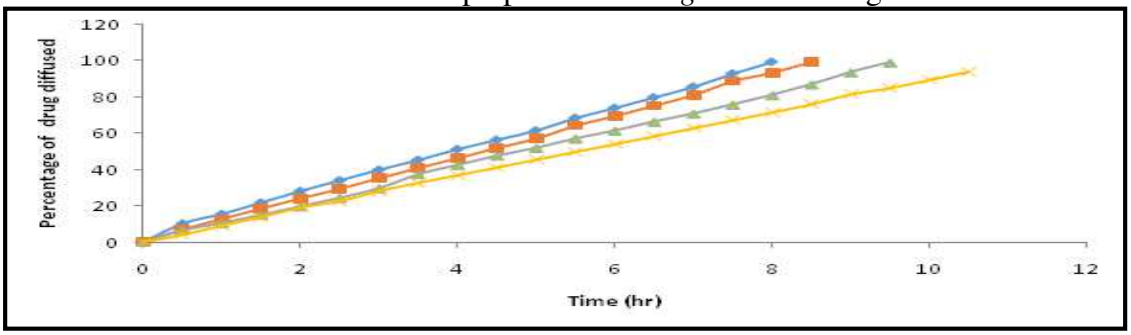

Figure No.5: Comparative *in vitro* drug release profile of Aceclofenac controlled release tablets prepared with different concentrations of *cashew nut* tree gum

(-■-) F_5 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.25 ratio
(-♦-) F_6 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.5 ratio
(-▲-) F_7 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.75 ratio
(-×-) F_8 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:1 ratio

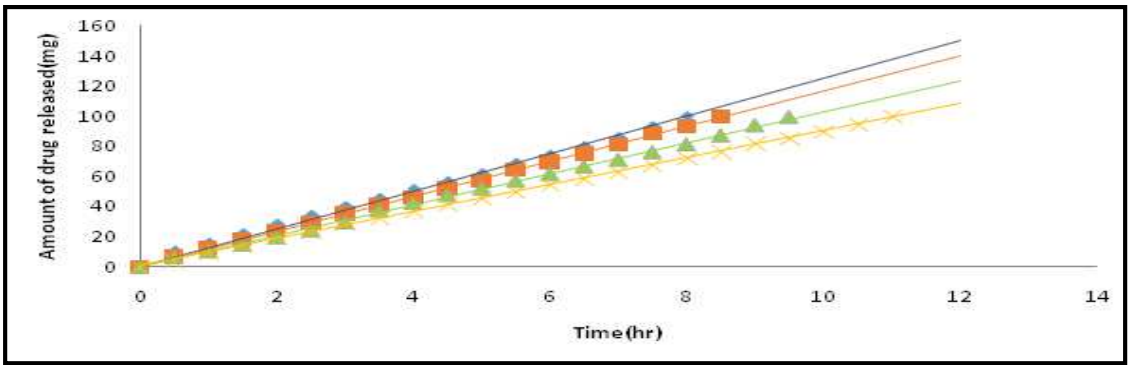

Figure No.6: Comparative Zero order plots of Aceclofenac controlled release tablets prepared with different concentrations of *cashew nut* tree gum

(-■-) F_5 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.25 ratio
(-♦-) F_6 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.5 ratio
(-▲-) F_7 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.75 ratio
(-×-) F_8 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:1 ratio

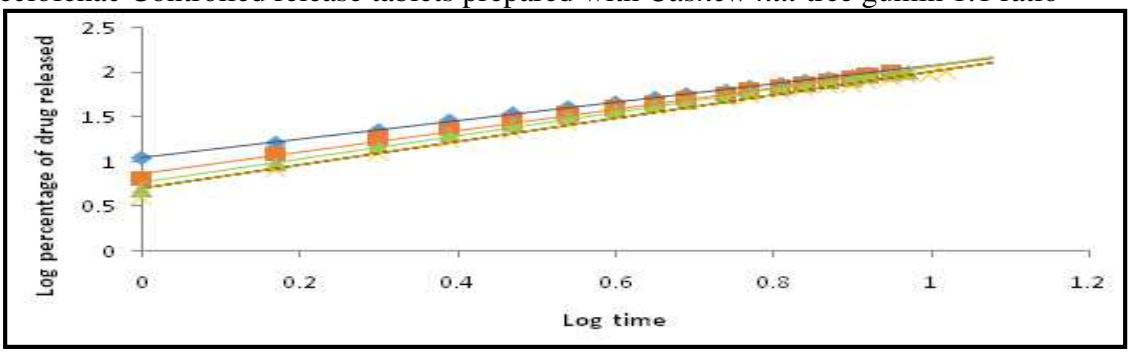

Figure No.7: Comparative Peppas plots of Aceclofenac controlled release tablets prepared with different concentrations of *cashew nut* tree gum

(-■-) F_5 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumgum in 1:0.25 ratio
(-♦-)F_6 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.5 ratio
(-▲-) F_7 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:0.75 ratio
(-×-) F_8 - Aceclofenac Controlled release tablets prepared with *Cashew nut* tree gumin 1:1 ratio

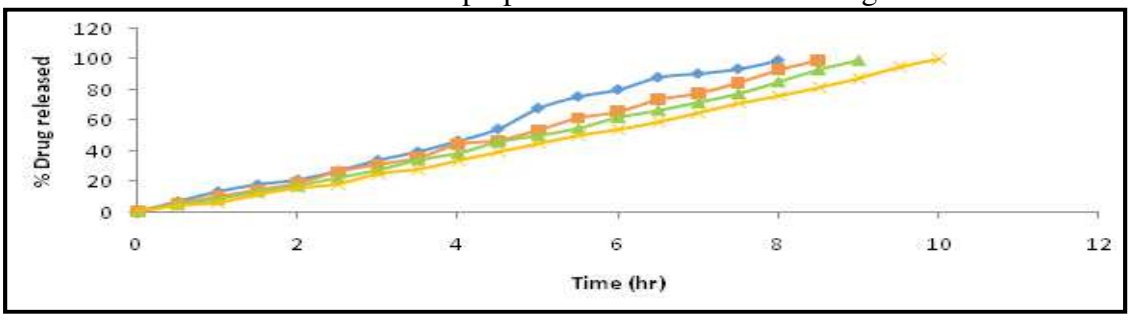

Figure No.8: Comparative *in vitro* drug release profile of Aceclofenac controlled release tablets prepared with different concentrations of *Moringaoleifera* gum

(-■-) F_9 - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.25 ratio
(-♦-) F_{10} - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.5 ratio
(-▲-) F_{11} - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.75 ratio
(-×-) F_{12} - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:1 ratio

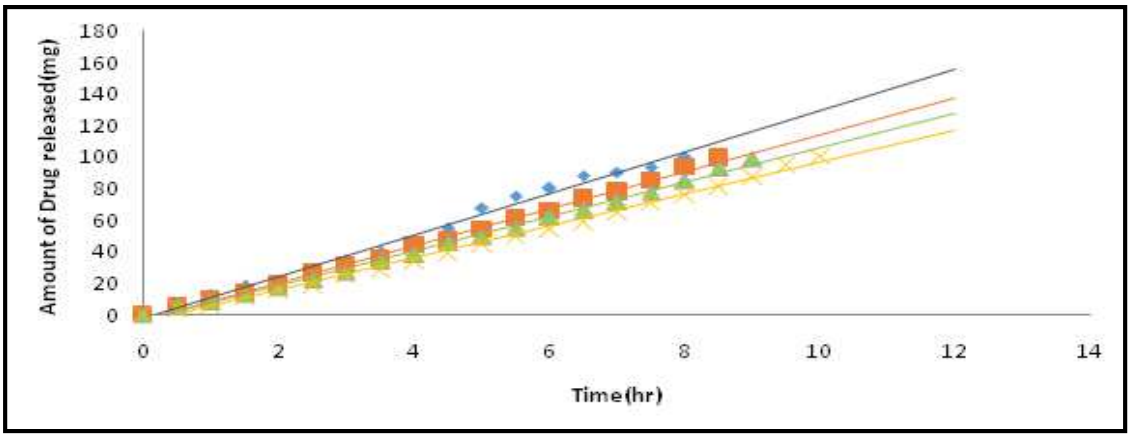

Figure No.9: Comparative Zero order plots of Aceclofenac controlled release tablets prepared with different concentrations of *Moringaoleifera* gum

(-■-) F_9 - Aceclofenac Controlled release tablets prepared with *Moringaoleifera* gumin 1:0.25 ratio
(-♦-) F_{10} – Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.5 ratio
(-▲-) F_{11} - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.75 ratio
(-×-) F_{12} - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:1ratio

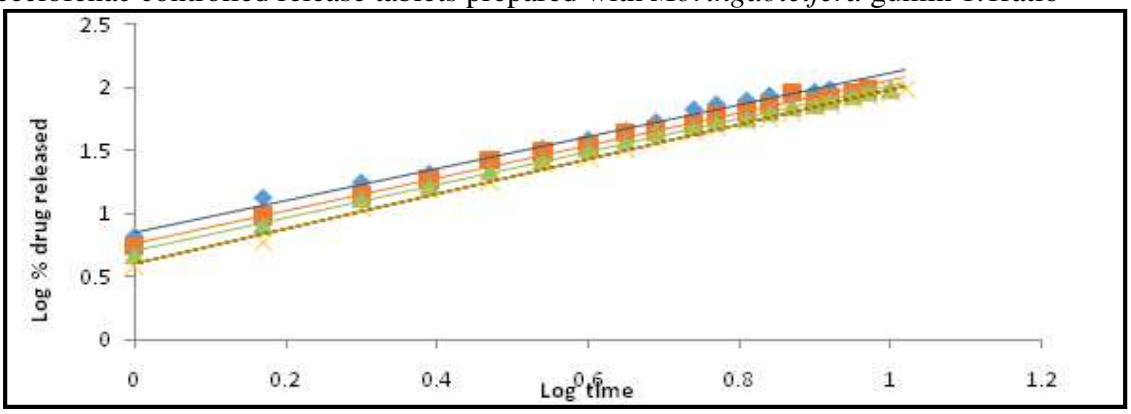

Figure No.10: Comparative peppas plots of Aceclofenac controlled release tablets prepared with different concentrations of *Moringaoleifera* gum

(-■-) F_9 - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.25 ratio
(-♦-) F_{10} - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.5 ratio
(-▲-) F_{11} - Aceclofenac controlled release tablets prepared with *Moringaoleifera* gumin 1:0.75 ratio
(-×-) F_{12} - Aceclofenac Controlled release tablets prepared with *Moringaoleifera* gumin 1:1 ratio

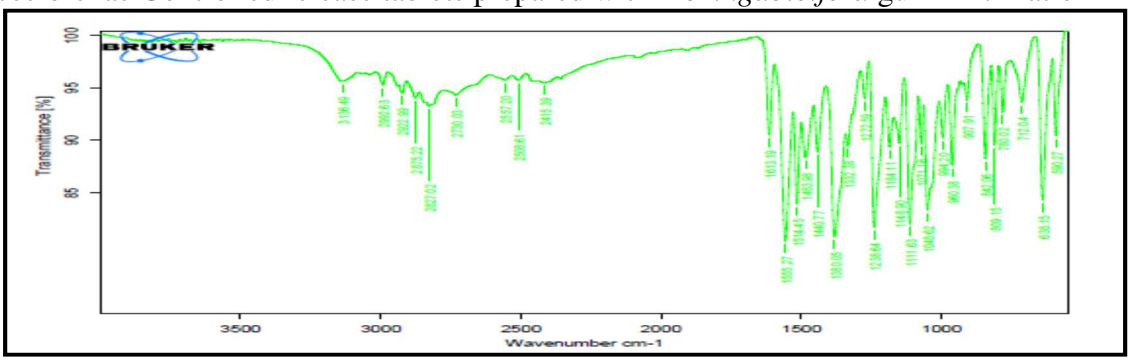

Figure No.11: FTIR spectrum of Aceclofenac

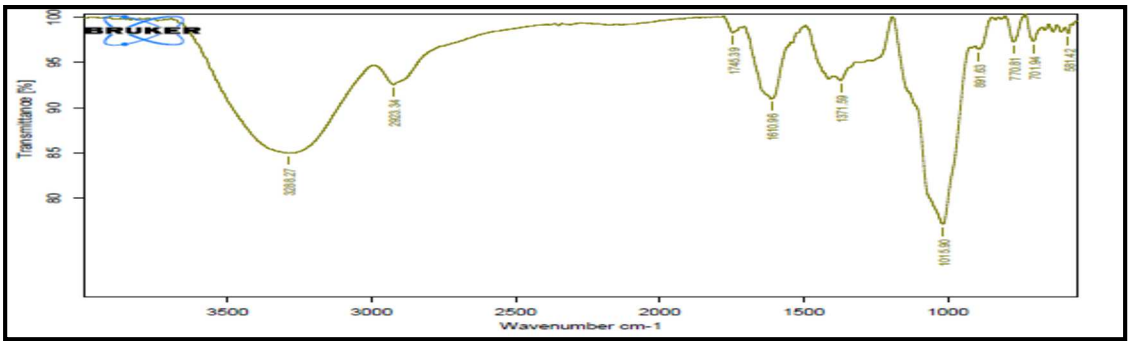

Figure No.12: FTIR spectrum of *Aeglemarmelos* gum

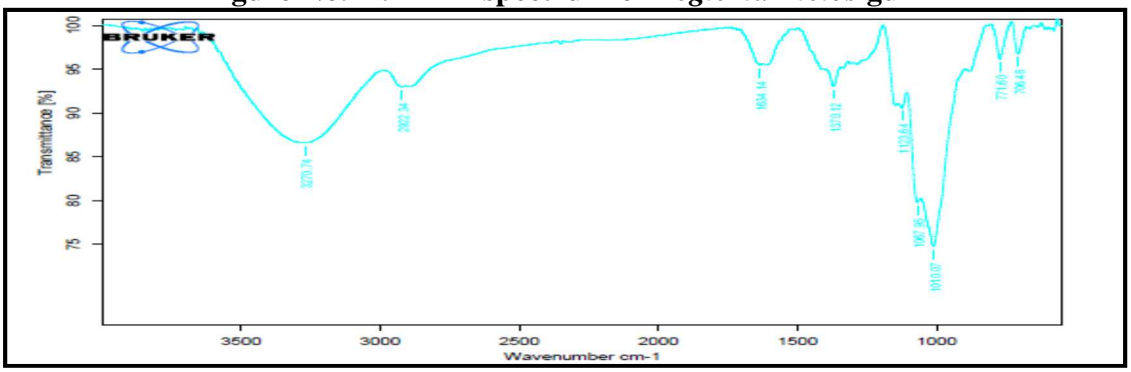

Figure No.13: FTIR spectrum of *Cashew nut* tree gum

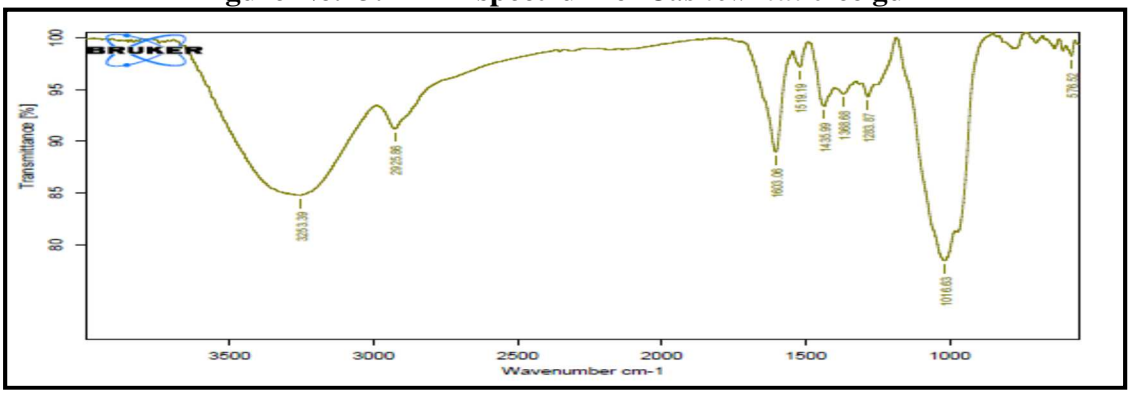

Figure No.14: FTIR spectrum of *Moringaoleifera* gum

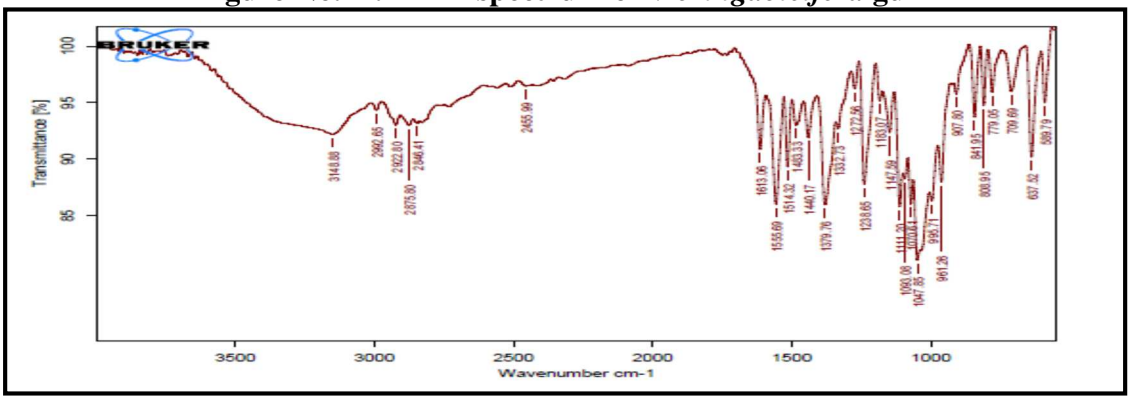

Figure No.15: FTIR spectrum of Aceclofenac controlled release tablets prepared with *Aeglemarmelos* gum

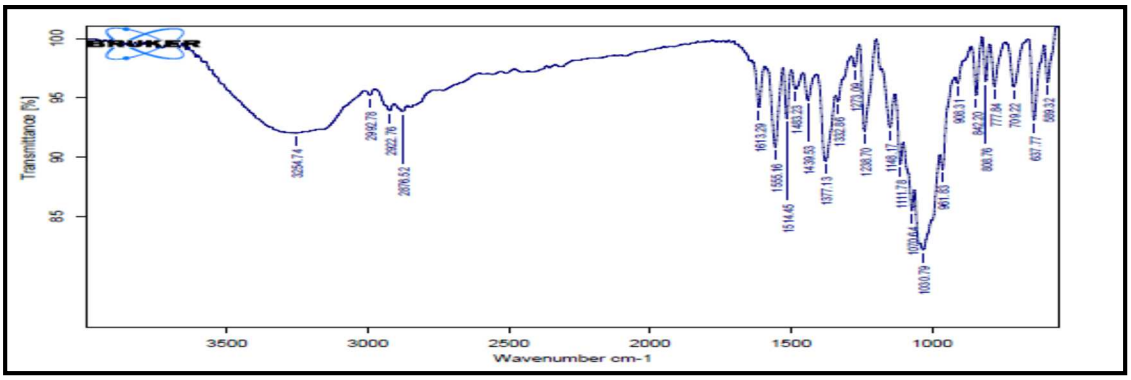

Figure No.16: FTIR spectrum of Aceclofenac controlled release tablets prepared with *Cashew nut* tree gum

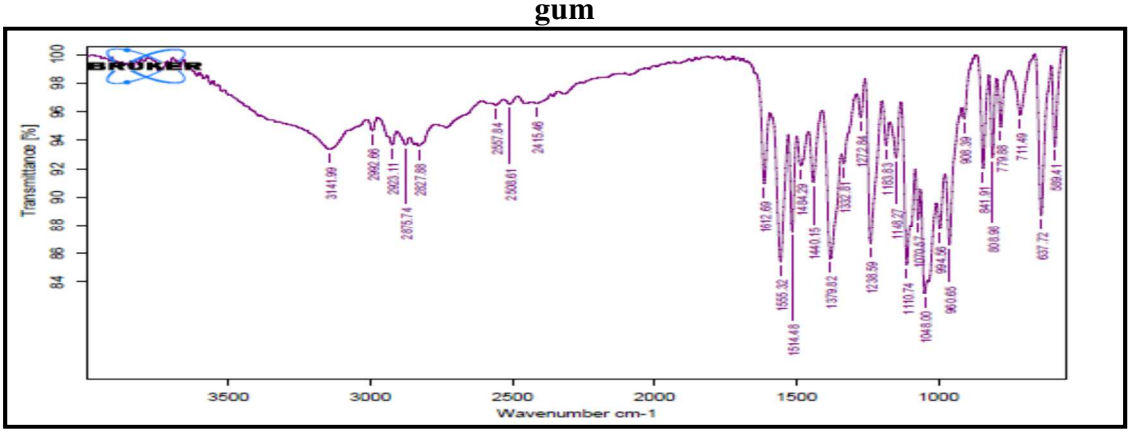

Figure No.17: FTIR spectrum of Aceclofenac controlled release tablets prepared with *Moringaoleifera* gum

CONCLUSION

The Aceclofenac controlled release tablets prepared with natural polymers such as *Aeglemarmelos gum, Cashew nut tree gum and Moringaoleifera* gum has shown prolonged release. Among the three polymers, Aeglemarmelos shows more prolonged release compared with other polymers (*Aeglemarmelos*>*Cashew nut* tree gum > *Moringaoleifera* gum). Aceclofenac controlled release tablets prepared with *aeglemarmelos* gum in 1:1 ratios shows more prolonged drug release compared with the other polymers (1:1 >1:0.75 > 1:0.5>1:0.25). The prepared Aceclofenac controlled release tablets compiles with the Indian Pharmacopeia standards. FTIR study clearly indicates that there is no drug - polymer interaction. All the formulations drug release followed zero order kinetics and the mechanism of the drug release was governed by peppas model.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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