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FORMULATION DEVELOPMENT AND SUSTAINED RELEASE OF MATRIX TABLETS OF ANTI-ANGINAL DRUGS

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ABSTRACT

The present investigation revealed that *Tamarindus kernels* mucilage and guar gum, Ethyl cellulose and HPMC appears to be suitable for use as a release retarding agents in the formulation of sustained release matrix tablets is good swelling, good flow and suitability for matrix formulation. From the dissolution study, it was concluded that *Tamarindus kernals* mucilage can be used as an excipient for making sustained release matrix tablets of Nicorandil. The formulated tablet was characterized by physical and chemical parameters, the *in-vitro* release of rate profile should the higher concentration of F2 polymer in tablet, the combination of hydrophilic and hydrophobic combination showed less result than use of alone.

KEYWORDS

Angina, Nicorandil matrix tablet, HPMC and Ethyl cellouse etc.

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INTRODUCTION

Tablet is a solid dosage form containing a unit dose of one or more medicaments. Tablets are flat or biconvex discs prepared by compressing a drug or a mixture of drugs with or without suitable excipients. Tablet may vary in shape and differ greatly in size and weight depending on the amount of medicinal substance and the intended mode of administration, with advancement in technology. That is convenient for patients perspective and utilize an approach that is unlikely to add complexity during regulatory approval process. To understand each dosage form, tablets here are classified by their route of administration and by the

type of drug delivery system they represent within the route.

EXPERIMENTAL WORK

Extraction of mucilage

Tamarindus seeds of 1kg are collected and washed with water to remove extra pulp.

These *tamarindus kernels* are then heated in a container along with sand for sometime,which gives brittleness to the external coat.

These heated kernels are crushed and removed the external coat to get the seeds.

The seeds obtained are kept in water for overnight and then boil for 5 to 7 hours, and then filtered to remove seeds.

Then the mucilage solution (filtrate) is heated for sometimes and kept in hot air oven at the temperature between 50 to 60°C until complete moisture is evaporated.

The dried mucilage is powdered and passed through sieve.no.100. Then the mucilage of 14gms is collected from 1kg of seeds and then stored well in an air tight container.

Evaluation tests for mucilages

Treat the test solution with ruthenium red solution pink colour is obtained.

Treat the test solution with thionine solution after 15 minutes wash with alcohol.

Mucilage forms violet red colour.

Treat the test solution with Chinese ink, transparent spherical dilated fragments on blackbackground are observed.

Formulation batches

Take 10ml of aqueous solution and add 25ml of absolute alcohol with constant stirring. Aprecipitate is formed which is dried in air and examined for its swelling properties.

Tablet preparation

All the ingredients were weighed accurately using digital weighing balance and werepassed through a 100 sieve.

The binder solution was prepared by dissolving *tamarindus kernels* mucilage in hexaneas solvent.

All the excipients are blended together. Then all the excipients, including drug were mixed in the binder solution according to their respective formulations (F1, F2, F3, F4 and F5).

The powder mixture was kept in hot air oven at 60^{o}C for complete evaporation ofhexane.

The tablets were prepared by direct compression method by using 15mm biconvex punches at the pressure of 35psi.

DISCUSSION

The formulation development of Nicorandil sustained release matrix tablets was done with different concentrations of natural polymers as a binding agent. Various evaluation tests were conducted for the formulated batches. *Tamarindus kernels* mucilage has been checked for some evaluation parameters to know the flow properties, Bulk density, Tapped density, Compressibility index and Hausner's ratio are calculated to know the flow properties of the mucilage.

The released profile of all the formulation is shown in the Figure No.7. The sustained release matrix tablets of Nicorandil prepared with different natural polymers in various concentrations.

The order of cumulative percentage drug released was F4>F2>F5>F3>F1 with values of 74%, 73%, 64%, 57%, 52 % respectively. The present study revealed that the formulation F4 with Drug: Gum ratio of (1:3.6) should greater cumulate percentage drug release and the formulation F1 with Drug: Gum ratio of (1:1.8) should lower cumulative percentage drug release.

Table No.1

S.No	Ingredients	F1	F2	F3	F4	F5
1	Nicorandil	80	80	80	80	80
2	Guar gum	320	--	--	150	--
3	Tamarindus gum	--	320	--	150	150
4	HPMC	--	--	320	--	150
5	Ethyl cellulose	--	--	--	20	20
6	Magnesium sterate	2.5	2.5	2.5	2.5	2.5
7	Talc	97.5	97.5	97.5	97.5	97.5
8	Total weight	500	500	500	500	500

Physical properties of matrix tablets

Table No.2

Formulation	Weight variation (%)	Thickness(mm)	Hardness(kg/cm2)	Friability(%)
F-1	1.9	4.6	4.1	0.50
F-2	3.7	4.7	3.9	0.45
F-3	4.6	4.7	4.8	0.35
F-4	2.4	4.7	4.9	0.78
F-5	3.5	4.6	4.8	0.65

STANDARD ABSORBANCE OF NICORANDIL

Table No.3

S.No	Concentration (µg/ml)	Absorbance at 260nm
1	0	0
2	10	0.105
3	20	0.165
4	40	0.324
5	60	0.459
6	80	0.632
7	100	0.765

Table No.4

S.No	Time (Hrs)	Absorbance (nm)	Concentration (µg/ml) (X)	X*900/1000	5*X/1000	Cumulative Amount	%Cumulative drug release
1	0	0	0	0	0	0	0
2	0.5	0.123	14.320	0.159	7.160	5.433	5.433
3	1	0.189	23.044	20.739	0.115	60.274	60.274
4	2	0.236	29.253	26.325	0.146	20.885	20.885
5	4	0.453	57.919	52.127	0.289	26.614	26.614
6	8	0.337	42.595	38.335	0.212	52.339	52.339
7	16	0.241	29.914	26.922	0.149	38.484	38.484
8	24	0.102	11.552	10.395	0.057	26.979	26.979

Table No.5

S.No	Time (Hrs)	Absorbance (nm)	Concentration (µg/ml) (X)	X*900/1000	5*X/1000	Cumulative Amount	%Cumulative drug release
1	0	0	0	0	0	0	0
2	0.5	0.229	28.328	25.495	0.414	10.414	10.414
3	1	0.285	35.601	32.040	0.178	25.673	25.673
4	2	0.304	38.236	34.412	1.191	32.321	32.321
5	4	0.632	81.565	73.408	0.407	36.819	36.819
6	8	0.482	61.750	55.575	0.308	73.716	73.716
7	16	0.104	11.810	10.629	0.059	55.634	55.634
8	24	0.096	10.751	-1.372	0.0056	10.634	10.634

Table No.6

S.No	Time (Hrs)	Absorbance (nm)	Concentration (µg/ml) (X)	X*900/1000	5*X/1000	Cumulative Amount	%Cumulative drug release
1	0	0	0	0	0	0	0
2	0.5	0.158	18.949	17.054	0.094	5.208	5.208
3	1	0.261	32.226	29.300	0.0162	17.216	17.216
4	2	0.345	43.652	39.286	0.218	29.518	29.518
5	4	0.497	63.731	57.357	0.318	39.604	39.604
6	8	0.365	46.494	41.664	0.231	57.588	57.588
7	16	024	30.706	27.635	0.153	41.817	41.817
8	24	0.183	22.252	20.026	0.111	27.746	27.746

Table No.7

S.No	Time (Hrs)	Absorbance (nm)	Concentration (µg/ml) (X)	X*900/1000	5*X/1000	Cumulative Amount	%Cumulative drug release
1	0	0	0	0	0	0	0
2	0.5	0.135	15.911	14.319	0.079	1.57	1.57
3	1	0.21	24.630	22.167	0.123	14.442	14.442
4	2	0.314	39.557	35.6013	0.178	22.345	22.345
5	4	0.643	83.018	74.716	0.373	35.974	35.974
6	8	0.405	51.578	46.420	0.232	74.648	74.648
7	16	0.302	37.972	34.174	0.170	46.59	46.59
8	24	0.012	-0.336	-0.302	-0.0015	34.172	34.172

Table No.8

S.No	Time (Hrs)	Absorbance (nm)	Concentration (µg/ml) (X)	X*900/1000	5*X/1000	Cumulative Amount	%Cumulative drug release
1	0	0	0	0	0	0	0
2	0.5	0.293	36.783	33.104	0.183	2.258	2.258
3	1	0.328	41.406	37.265	0.207	33.311	33.311
4	2	0.489	62.675	56.407	0.313	37.578	37.578
5	4	0.551	70.871	63.783	0.354	56.761	56.761
6	8	0.464	59.372	53.434	0.296	64.079	64.079
7	16	0.381	48.408	43.567	0.242	53.676	53.676
8	24	0.238	29.517	26.565	0.470	44.037	44.037

Table No.9: %Cumulative drug release of all formulations (F1, F2, F3, F4, and F5)

S.No	Time	%Cumulative drug release of F1	%Cumulative drug release of F2	%Cumulative drug release of F3	%Cumulative drug release of F4	%Cumulative drug release of F5
1	0	0	0	0	0	0
2	0.5	5.433	10.414	5.208	1.57	2.258
3	1	60.274	25.673	17.216	14.442	33.311
4	2	20.885	32.321	29.518	22.345	37.578
5	4	26.614	36.819	39.604	35.974	56.761
6	8	52.339	73.716	57.588	74.648	64.079
7	16	38.484	55.634	41.817	46.59	53.676
8	24	26.979	10.634	27.746	34.172	44.037

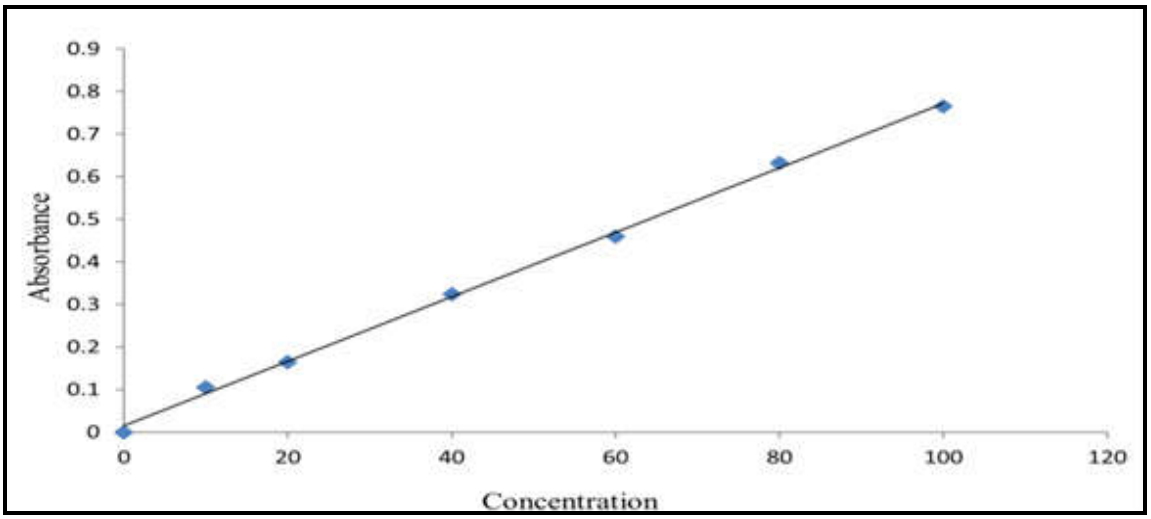

Figure No.1: Calibration curve of nicorandil

FORMULATION 1

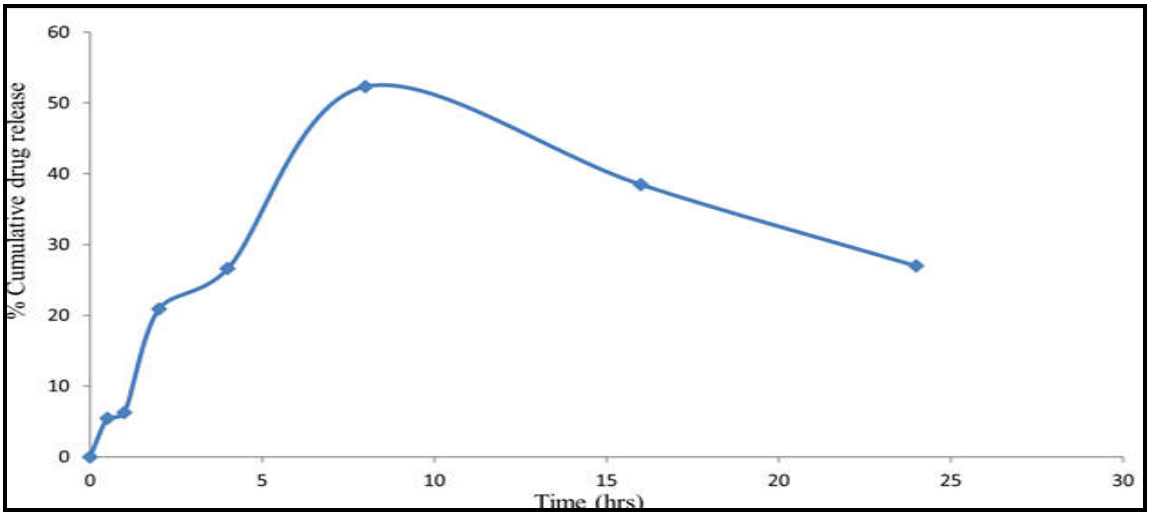

Figure No.2: % Cumulative drug release for Formulation 1

FORMULATION 2

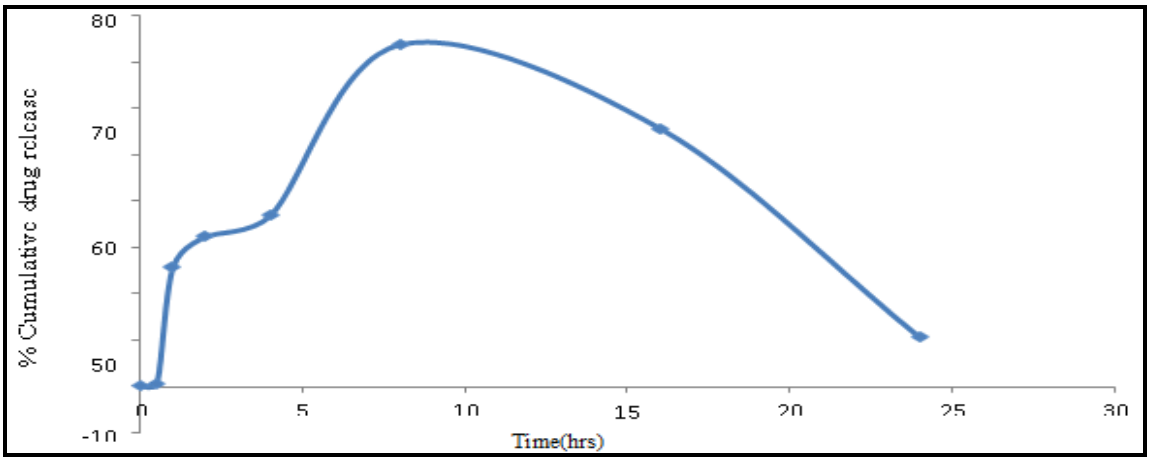

Figure No.3: % Cumulative drug release for Formulation 2

FORMULATION 3

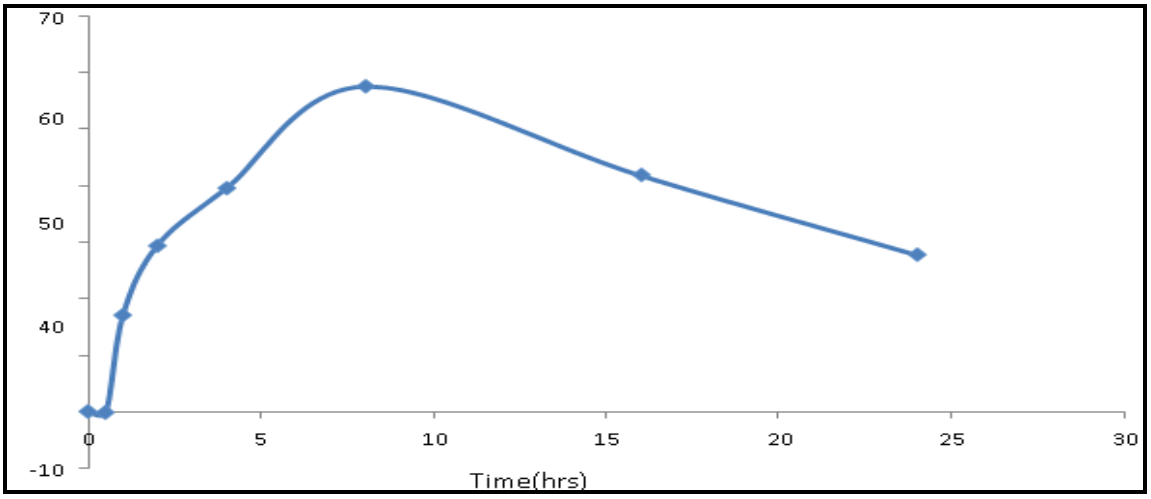

Figure No.4: %Cumulative drug release for Formulation 3

FORMULATION 4

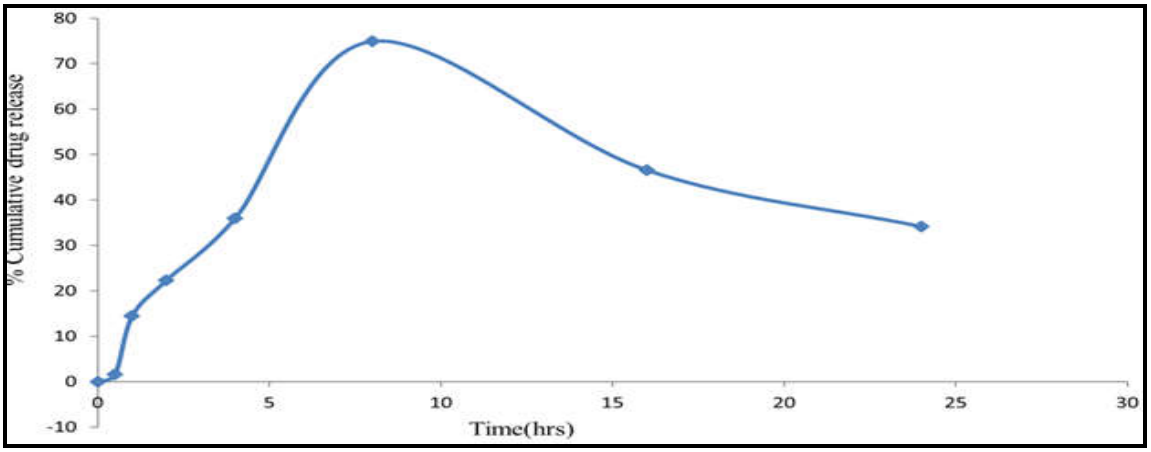

Figure No.5: %Cumulative drug release for Formulation 4

FORMULATION 5

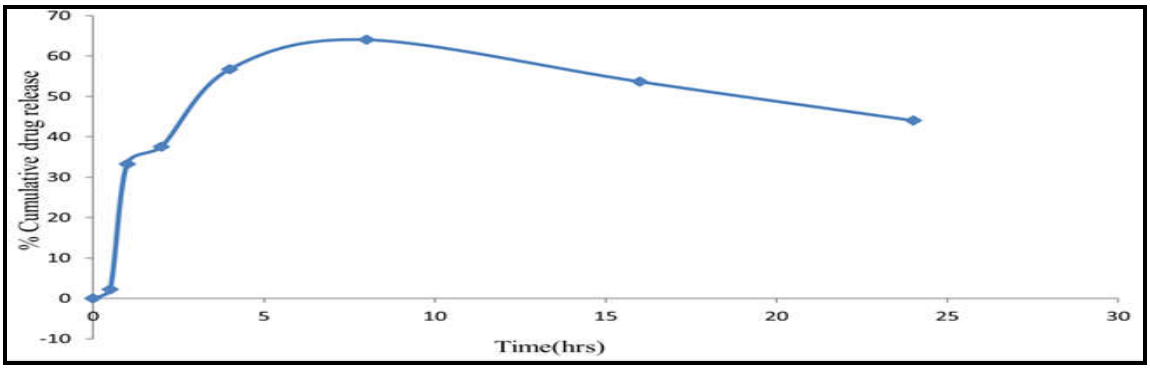

Figure No.6: %Cumulative drug release for Formulation 5

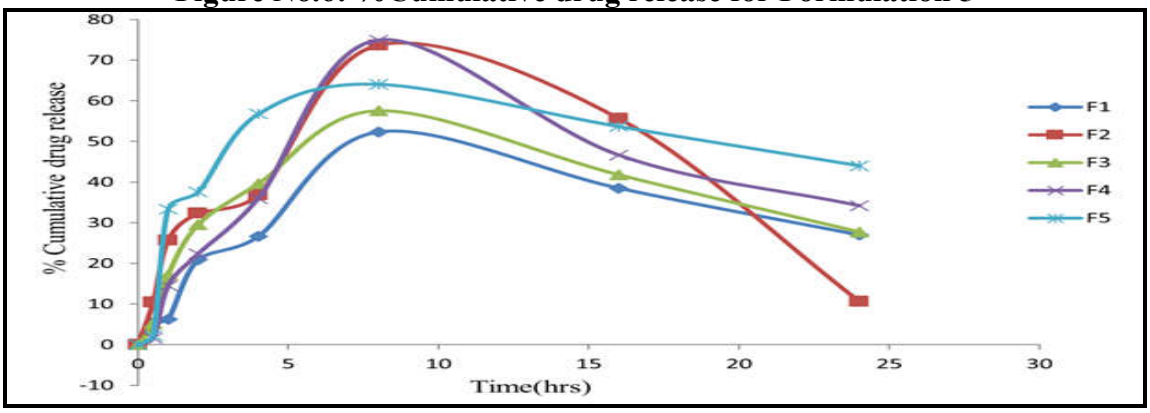

Figure No.7: Cumulative drug release of all formulations (F1, F2, F3, F4, and F5)

CONCLUSION

The present investigation revealed that *Tamarindus kernels* mucilage and guar gum, Ethyl cellulose and HPMC appears to be suitable for use as a release retarding agents in the formulations. From the dissolution study, it was concluded that *Tamarindus kernals* mucilage can be used as an excipient for making sustained release matrix tablets of Nicorandil.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

REFERENCES

1. Lachman L, Liberman H and Kanig J. The theory and practice of industrial pharmacy, *Philadelphia,* 3rd Edition, 1986, 293-345, 346-373.
2. Aulton M. Pharmaceutics; The science of dosage form design, International Student, *Churchill Livingstone,* 2nd Edition, 304-321, 347-668.
3. Ansel H. Allen L and Jr. Popovich N. Ansel's Pharmaceutical dosage forms and drug delivery systems, *Lippincott Williams and Wilkins,* 8th Edition, 2004, 227-259.
4. Vyas S and Khar R. Controlled drug delivery concepts and advances, *Amazon.com,* 1st Edition, 2012, 219-256.
5. Remington J. Remington: The science and practice of pharmacy, *Pharmaceutical Press,* 2, 19th Edition, 2012, 1615-1641.

6. Tripathi K D. Essential of medical pharmacology, *Jaypee Brothers Medical Publishers Pvt. Ltd, Delhi,* 4th Edition, 1998.
7. Sai Kishore V. Formulation and evaluation of various anti-anginal drugs using natural polymers.
8. Sh. Lakade. Formulation and evaluation of sustained release matrix tablet of anti-anginal drug influence of combination of hydrophobic and hydrophillic matrix former research, *J.Pharm and Ttech,* 1(4), 2008, 410-413.
9. Basavaraj, Someswara Rao B, Kulkarni S V, Pramod Patil, Chetan Surpur. Design and characterization of sustained release Aceclofenac matrix tablets containing tamarind seed polysaccharide, *Asian J. Pharm. Tech,* 1(1), 2011, 17-21.
10. Rishabha Malviya, Pranati Srivastava, Mayank Bansal, Pramod Kumar Sharma. Formulation, evaluation and comparison of sustained release matrix tablets of diclofenac sodium using tamarind gum as release modifier, *Asian Journal of Pharmaceutical and Clinical Research,* 3(3), 2010, 238-241.
11. Raju Manda, Sundaramoorthy K, Vetrichelvan T. Formulation and *in-vitro* evaluation of sustained release matrix tabelts of Aceclofenac by using different natural polymers, *Research Journal of Pharmaceutical Technology, Biological and Chemical Sciences,* 1(4), 2010, 279-291.
12. Shalaka Dhat, Sanjivani Aphale, Uddhav Bagul, Amol Tagalpallewar, Swapnila Vanshiv, Nisarg Shah Effect of two different diluents on release profile of Aceclofenac from sustained release matrix tablets using gum damar as release retardant, *International Journal of Pharmacy and Pharmaceutical Sciences,* 3(4), 2011, 307-313.

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