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A Brief Review on Sustained Release Tablet of Glimperide by Using Natural and Synthetic Polymer

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Abstract: ***The present research work was aimed to develop matrix tablets of Glimepiride with Aloe barbadensis miller leaves mucilage and Povidone and to study its functionality as a matrix forming agent for sustained release tablet formulations. Physicochemical properties of dried powdered mucilage of Aloe barbadensis miller mucilage and Povidone tablet blend were studied. Various formulations of Glimepiride Aloe barbadensis miller mucilage and Povidone were prepared. They found to have better satisfactory physicochemical properties with low SD values. The swelling behavior and release rate characteristics were studied. The dissolution study proved that the dried Aloe barbadensis miller mucilage and Povidone combination can be used as a matrix forming material for making Sustained release matrix tablets.***

Keywords: Glimepiride, Aloe barbadensis miller, Povidone, matrix tablets, sustained release.

1. Introduction

The mucilage of Aloe barbadensis miller leaves clinically and experimentally proved anti-diabetic activity (Boudreau MD, Beland FA, 2006) and release retardant activity in the present study. Glimepiride is an oral hypoglycemic agent, which is commonly prescribed for the treatment of patients with type II diabetes mellitus (Kahn, C. R and Shechter Y 1991). It belongs to sulfonylureas drug class. Glimepiride is a weak acid with PKa of 6.2. Glimepiride is practically insoluble in water and acidic environment but highly permeable (class 2) according to the Biopharmaceutical classification System (BCS) (Jain A., 2008). The oral absorption is uniform, rapid and complete with nearly 100% bioavailability (Gorus FK., 1988). Therapy with Glimepiride is usually initiated with 1 to 2 mg (Jamzad S and Fassihi R., 2006). The pharmacokinetics and dosage schedule supports once daily sustained release formulations for Glimepiride for better control of blood glucose levels to prevent hypoglycemia, enhance clinical efficacy and patient compliance (Ikegami H, et al., 1986). The objective of present investigation is to design and evaluate sustained release tablets of Glimepiride using Aloe barbadensis miller leaves mucilage and Povidone combination as release retardant for making sustained release matrix tablets

2. Materials and Methods

Glimepiride was obtained as a gift sample from Dr. Reddy's Laboratories, Hyderabad, India. Aloe barbadensis miller leaves were collectedfrom plants growing in local areas of Anantapur, India. The plant was authenticated at the Botany Department of Sri Krishnadevaraya University, Anantapur, India. Povidone, Micro crystalline cellulose and Magnesium stearate were procured from SD Fine chemicals (Mumbai, India). All other chemicals used were of analytical reagent grade and double distilled water was used throughout the .experiments

Extraction of mucilage (Baveja SK et al., 1988)
The fresh Aloe barbadensis miller leaves were collected and washed with water. Incisions were made on the leaves and left over night. The leaves were crushed and soaked in water for 5–6 hours, boiled for 30 minutes and left to stand for 1 hour to allow complete release of the mucilage into the water. The mucilage was extracted using a multi-layer muslin cloth bag to remove the marc from the solution. Acetone (three times the volume of filtrate) was added to precipitate the mucilage. The mucilage was separated, dried in an oven at 40°C, collected, grounded, passed through a # 80 sieve and stored in desiccator at 30°C & 45% relative humidity till use. Before tablet compression the formulated tablet blend was evaluated for flow properties which were shown in Table 1. All values were found to be satisfactory.

Flow properties if aloe barbandesis miller mucilage and power blend.

Parameters	Values
1.Loose Bulk density (g/ml)	0.575±0.08
2.Tapped Bulk Density(g/ml)	0.788±0.03
3.carr's index(%)	26.59±0.21
4.Hausner's Ratio	1.24±0.04
5.Angel of repose(O)	29.45±1.68
Number of Experiments(n)=3	

Preparation of matrix tablets
Sustained release matrix tablets of Glimepiride with Aloe barbadensis miller leaf mucilage and Povidone were prepared by using different drug: mucilage ratios as shown in Table 2, Aloe barbadensis miller leaves mucilage and Povidone were used as matrix forming materials while microcrystalline cellulose as a diluent and magnesium stearate as a lubricant. All ingredients used were passed through a # 100 sieve, weighed and blended. The granules were prepared by wet granulation technique and compressed by using 10 mm flat faced punches.

Table 2: Formulae of matrix tablets

Ingredients (mg)	GAP-1	GAP-2	GAP-3	GAP-4	GAP-5
Glimepiride	2	2	2	2	2
Aloe barbandesis miller leaves dried mucilage	2.5	5.0	7.5	10.0	12.5
Povidone	5.0	5.0	5.0	5.0	5.0
Micro crystalline cellulose (Avicel)	85.5	183	180.5	178	175.5
Magnesium sterate	5	5	5	5	5
Total weight of tablet	200	200	200	200	200

Swelling behavior of matrix tablets (Killedar S.G., 2008)
The extent of swelling was measured in terms of % weight gain by the tablet. The swelling behavior of formulation GAP-1, GAP-2, GAP-3, GAP-4 and GAP-5 were studied. One tablet from each formulation was kept in a petri dish containing phosphate buffer of pH 7.4. At the end of 2 hours, the tablet was withdrawn, kept on tissue paper and weighed, repeated for every 2 hours till the end of 12 hours. The % weight gain by the tablet was calculated by eq.1. S.I = {(Mt-M0) / M0} X 100 ------ (1) Where, S.I = Swelling Index, Mt = Weight of tablet at time 't' and M0 = Weight of tablet at time 0. Swelling behavior of formulated sustained release matrix tablets were represented in fig.4.

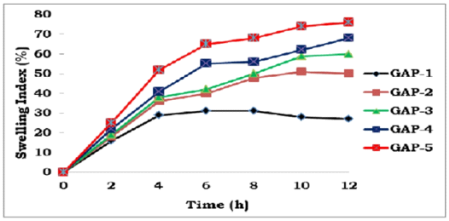


Figure. 4: Swelling Index of formulated matrix tablets

3. Evaluation

Pre-compression parameters Compatibilities study
The compatibility of drug and polymers under experimental condition was conducted using FTIR studies. In the present study, the p., angle of repose, loose bulk density (LBD), tapped bulk density (TBD), carr's compressibility index and hausner's ratio

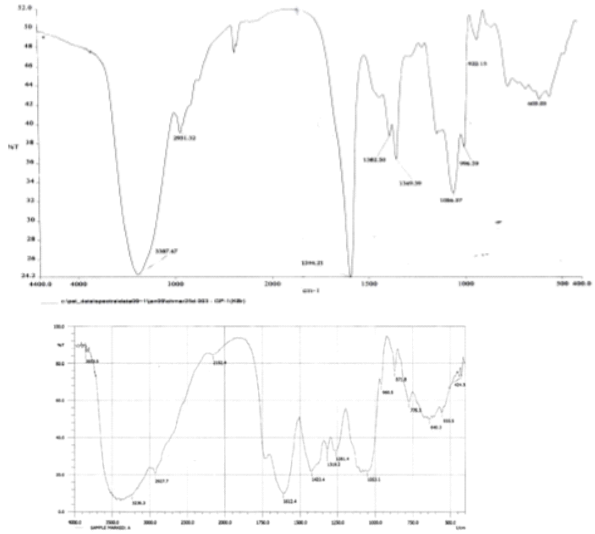
Post compression parameters
The formulated tablets were evaluated for various parameters viz., thickness, hardness and friability were found to be satisfactory (Lachman L, Lieberman HA., 1987) and these tablets have uniformity of drug content which was represented in Table 3.

In vitro drug release
Studies Release of Glimepiride from the matrix tablets was studied in phosphate buffer of pH 7.4 (900 ml) using United States Pharmacopoeia (USP) 8-station Dissolution Rate Test Apparatus (Model Electro lab, TDT- 06T, Mumbai, India) with a rotating paddle stirrer at 50 rpm and 37° ± 0.5°C. A sample of Glimepiride matrix tablets equivalent to 2 mg of Glimepiride was used in each test. Samples of dissolution fluid were withdrawn through a filter (0.45 µm) at different time intervals and were assayed at 229 nm for Glimepiride content using a UV/ visible single-beam spectrophotometer-117 (Systronics Corporation, Mumbai, India). The drug release experiments were conducted in triplicate (n=3). The in- vitro release rates were showed in Figure. 5. And this dissolution data was further treated for kinetic modeling. potassium bromide disc (pellet) method was employed.

Formulation	Thickness	Hardness	friability	Drug content
F1	3.17±0.064	7.50±1.25	0.50±0.01	100.2±3.95
F2	2.84±0.101	8.10±1.40	0.85±0.04	101.2±5.24
F3	3.4±0.050	6.50±1.35	0.44±0.03	98.5±2.50
F4	3.46±0.074	6.80±1.45	0.62±0.06	98.9±2.16
F5	2.85±0.035	7.40±1.30	0.73±0.07	100.5±3.63

4. Result

The compatibility of Glimepiride with the polymer used (Aloe barbadensis miller and Povidone) were studied by FTIR spectrums, which were shown in Figure.1, 2 and 3. The result of angle of repose was found to be 29.45±1.680. The results of LBD and TBD were 0.578±0.08 g/ml, 0.788±0.03 g/ml respectively and the Hausner's ratio was found to be 1.24±0.04. The compressibility Index was found to be 26.59±0.21%. The thickness of the tablets was ranged from 5.4±0.41 to 6.5±0.58 mm. The average percentage deviation of 20 tablets of each formula was less than ±7.5%. Drug content was found to be uniform among different batches of the tablets and ranged from 99.5±2.56 to 101.2±5.25. The hardness of formulated tablets were ranged from 6.50±1.45 to 8.10±1.40kg/cm2 and percentage friability of the tablets of all formulations were ranged from 0.44±0.03 to 0.85±0.05 which was <1% and represented in Table 3. The result of dissolution rate of matrix tablets was decreased with increase in mucilage concentration. Among the formulations, GAP-5 showed the least deviation from the theoretical release pattern. The kinetic models on drug release from dosage form were shown in Table 4 and 5 and represented in Figure.6, 7, 8 and 9.


: Infrared Spectrum of *Aloe barbadensis miller* leaves mucilage and Povidone

4: Kinetic Values Obtained from In-Vitro Release Profile for Matrix Tablets of Glimepiride (Zero order and First order)

First order values				
Formulation	Slope	REgrresion coefficent	Slope (N)	Reggression coefficent
F1	-0.0007	-9684	0.0034	0.9803
F2	-0.0004	-9867	0.0028	0.9924
F3	-0.0015	-9726	0.0059	0.996
F4	-0.0015	-9925	0.0064	0.9881
F5	-0.0017	-9723	0.0067	0.9951

F1	1.7349	0.9617	0.1524	0.9302	-0.0004	-0.9830
F2	1.8651	0.9964	0.1615	0.9486	-0.0003	-0.9957
F3	1.1034	0.9850	0.2875	0.9473	-0.0006	-0.9950
F4	3.2346	0.9934	0.3131	0.9744	-0.0008	-9944
F5	3.3085	0.9939	0.3045	0.9685	-0.0009	-0.9920

5. Discussion

The characteristic peaks in FTIR spectrums of

Fig. 7: Zero order release plots

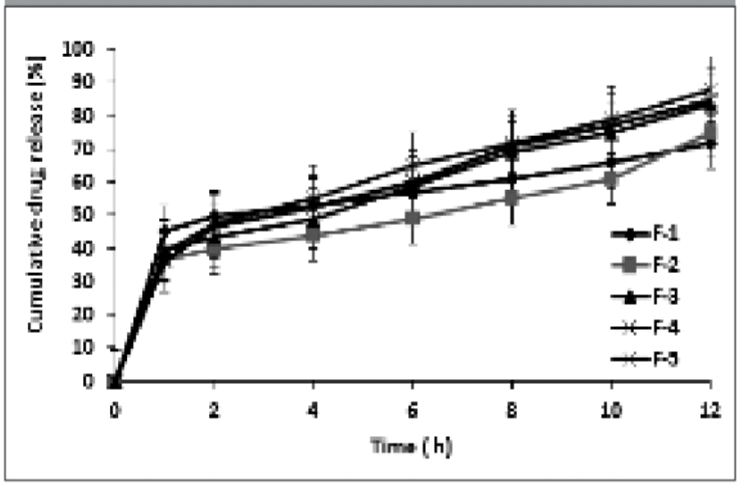


Fig. 8: First order release plots

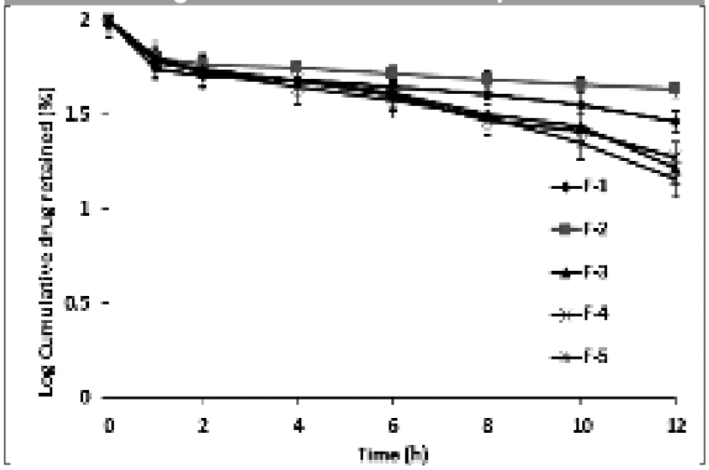


Fig. 9: Higuchi plots

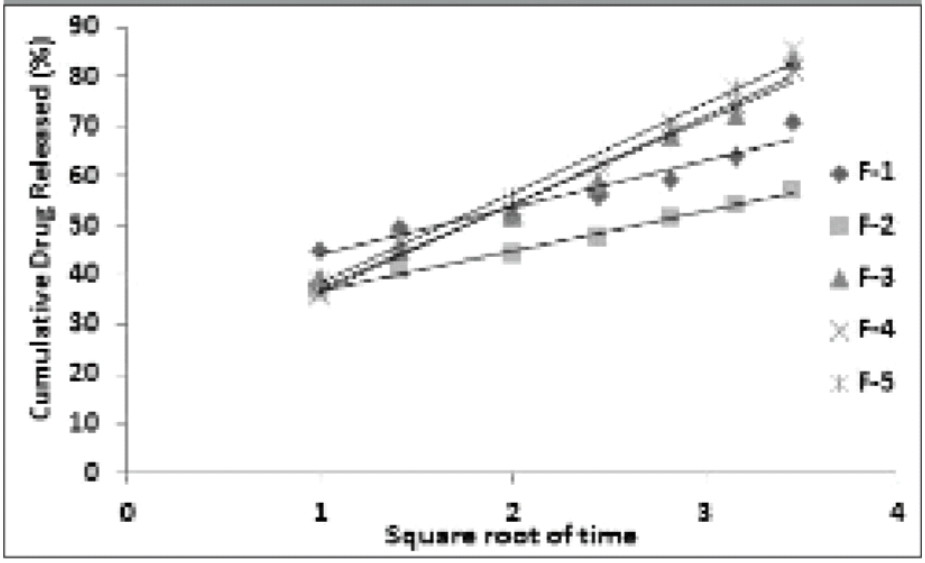


Fig.10: Korsmeyer Peppa's plots

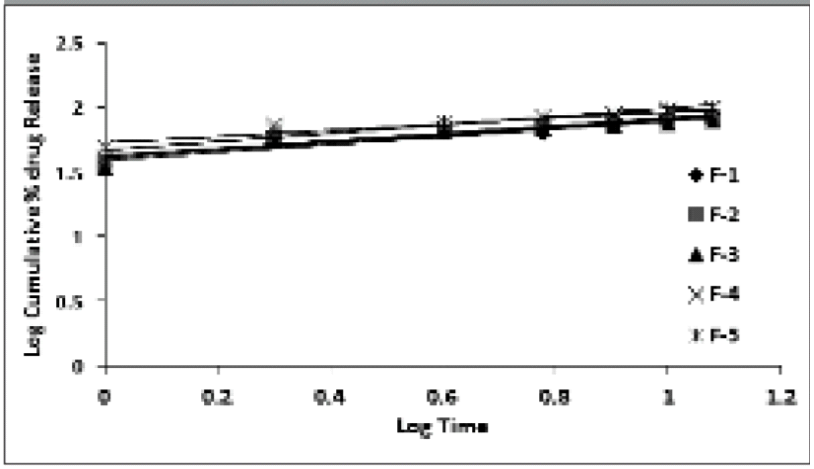
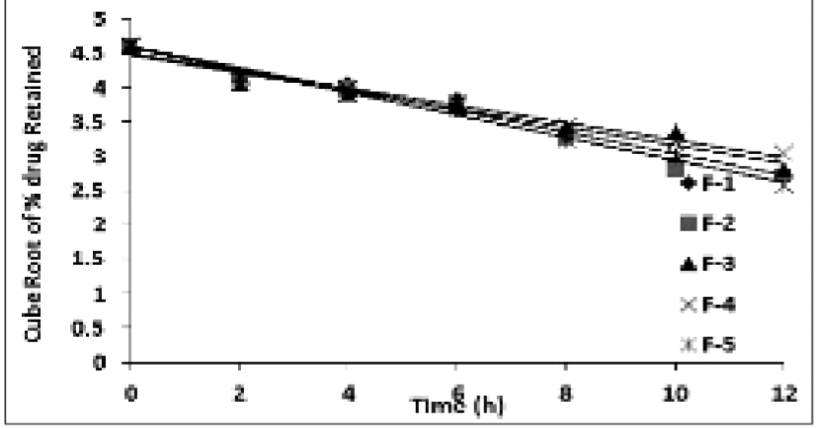


Fig.11: Hixson Crowell's plots



6. Discussion

Glimepiride were also seen in the FTIR spectrum of formulated blend. In the present study, Aloe barbadensis miller mucilage and Povidone has been employed to formulate sustained-release tablets of Glimepiride. The flow property of powdered blend was evaluated for angle of repose, LBD, TBD, compressibility index and drug content. The angle of repose, bulk densities and compressibility index values indicate that the Aloe barbadensis miller leaves muicilage and Povidone possessed satisfactory flow properties and compressibility index. The matrix tablets of different formulations showed uniform thickness. The weights of matrix tablets were within the limits as prescribed in Pharmacopoeia. i.e., for the tablets of more than 80 mg and less than 250 mg is ±7.5%. The average percentage deviation of all tablet formulations was found to be within the above limit and hence all formulations passed the test for uniformity of weight as per official requirements. Good uniformity in drug content was found among different batches of the tablets and the percentage of drug content was more than 99%. Another measure of a tablet's strength is friability. Conventional compressed tablets that lose less than 1% of their weight are generally considered acceptable. In the present study, the percentage friability for all the formulations was below 1%, indicating that the friability is within the prescribed limits. All the tablet formulations showed acceptable pharmacopoeial properties for weight variation, drug content, hardness and friability. The rate of release was faster in GAP-1 and slower in GAP-5. To know the mechanism of drug release from these formulations, the dissolution data was treated using zero order, first order, Higuchi plot, Korsmeyer Peppa's plot and Hixon-Crowell Models. The kinetic models were perfectly fitting to the formulated Glimepiride matrix tablets with Aloe barbadensis miller and Povidone.

7. Conclusion

The present study revealed that Aloe barbadensis miller leaves mucilage and Povidone combination appears to be suitable for use as a release retardant in the manufacture of sustained release matrix tablets because of its good swelling, good flow and suitability for matrix formulations. From the dissolution study, it was concluded that dried Aloe barbadensis miller leaves mucilage in combination with Povidone forms a good matrix for sustained release of drug from the tablets.

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References

[1] Baveja SK, Rao KV and Arora J, (1988), "Examination of Natural Gums and Mucilages as Sustaining Agents in

Tablet Dosage Forms," Indian J. Pharm. Sci. 50 (2); 89–92

[2] Boudreau MD, Beland FA, (2006), "An evaluation of the biological and toxicological properties of Aloe barbadensis (miller), Aloe vera". Journal of environmental science and health. Part C, Environmental carcinogenesis & ecotoxicology reviews 24 (1); 103–54.

[3] Gorus FK, Schuit FC, Intveld PA (1988), Interaction of sulfonyl ureas with pancreatic beta cells-A study with Glimepiride. Diabetes; 37:1090-5.

[4] Ikegami H, Shima K, Tanaka A, Tahara Y, Hirota M (1986), Interindividual variation in the absorption of Glimepiride in man. Acta Endocrinol Copenh; 111: 1986, 528-32

[5] Jamzad, S and Fassihi, R, (2006), Development of a controlled release low dose class II drug-glimepiride, Int. J. Pharmaceutics, 312 (1-2); 24-32.

[6] Jain, A, Ghosh, B, Rajgor, N and Desai, B. G., (2008), Passive and iontophoretic permeation of glimepiride, Eur. J. Pharmaceutics and Biopharmaceutics, 1-6.

[7] Kahn, C. R. and Shechter, Y, (1991),Oral hypoglycemic agents and the pharmacology of the endocrine pancreas. In: Theodore, W. R., Alan, S. N., Taylor, P and Gilman, A. G., eds. Goodman and Gilman's The Pharmacological Basis of Therapeutics, 8th Ed, McGraw-Hill, New York; 1484.

[8] Killedar S.G,Bhagwat D.A, Adnaik R.S,More H.N.and D'souza J.I., (2008), "optimization of method for determination of swelling factor of Ispaghula husk seeds," Indian Drugs 45 (4); 310–313.

[9] Lachman L, Lieberman HA, Kanig JL., (1987), The Theory and Practice of Industrial Pharmacy, Philadelphia, PA