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FORMULATION AND EVALUATION OF SUMATRIPTAN ORAL DISINTEGRATING TABLETS BY USING HIBISCUS ROSA SINESIS

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ABSTRACT

ODTs may be used to deliver drugs to the oral cavity, for local action or, in some cases, absorption across the oral mucosa, thereby avoiding first-pass hepatic metabolism and potentially increasing the rate and extent of uptake, and reducing undesirable metabolites. The objectives of the research work is to formulate oral disintegrating tablets of sumatriptan by using natural super disintegrate i.e, Hibiscus Rosa Sinesis in different ratio by direct compression technique and tablets were evaluated for precompressional parameters such as angle of repose, bulk density, tapped density, compressabilit index and postcompressional Parameters like drug content and in-vitro drug release study, hardness, friability, wetting time and invitro dispersion time, Invitro disintegration time and Invitro dissolution time. The physical interactions of the individual drug and optimized formulations were studied by the using of FTIR spectroscopy.

Key words: *Sumatriptan, Hibiscus rosa mucilage, Direct Compression Method.*

INTRODUCTION

Oral disintegration tablets are the novel technology for administration of the drug through the oral route. ODT's are solid unit dosage forms, which disintegrate or dissolve rapidly in the mouth without chewing and water. Many patients find it difficult to swallow like pediatric and geriatric and those people who are travelling or little access to water and some patients who are mentally ill like schizophrenia they are also did not take medicine, oral disintegrating tablets solve these problems. An Oral disintegration tablets is a solid dosage form that disintegrates and dissolves in the mouth without water within 60 seconds or less. orally disintegrating tablets provide an advantage particularly for pediatric and geriatric populations who have difficulty in swallowing conventional tablets and capsules. Additionally, pediatric patients may suffer from ingestion problems as a result of underdeveloped muscular and nervous control [1, 2].

Over a decade, the demand for development of orally disintegrating tablets (ODTs) has enormously increased as it has significant impact on the patient compliance. Orally disintegrating tablets offer an advantage for populations who have difficulty in swallowing. It has been reported that Dysphagia [3] (difficulty in swallowing) is common among all age groups and more specific with pediatric, geriatric population along with institutionalized patients and patients with nausea, vomiting, and motion sickness complications. ODTs with good taste and flavor increase the acceptability of bitter drugs by various groups of population. "A solid dosage form containing medicinal substance or active ingredient which disintegrates rapidly usually within a matter of seconds when placed upon the tongue [4]." ODT products have been developed for numerous indications ranging from migraines (for which rapid onset of action is important) to mental illness (for which patient compliance is important for treating chronic indications such as depression and schizophrenia).

MATERIALS AND METHODS

Sumatriptan [5] was obtained from a gift sample from Pharmatrain, Hyderabad. Hibiscus rosa-sinesis obtained locallyt. Mannitol [6], Aerosil, MCC Ph 102, Magnesium Stearate, were purchased from Elite chemicals, Guntur. All excipients and solvents are analytical grade.

Extraction of mucilage of Hibiscus Rosa Sinesis: [7]

The fresh leaves of Hibiscus rosa –sinesis linn were collected, washed with water to removed dirt and debris, dried and powdered. The powdered leaves were soaked in water for 5-6hrs boiled for 30mins and kept a side for 1hr for complete release of the mucilage into water. The material was squeezed from an 8fold muslin cloth bag to remove the marc from the solution. Acetone was added to the filterate to precipitate the mucilage in a quantity of 3times in the volume of the total filtrate. Th mucilage was separated, dried in an oven at a temperature less than 15°c, collected, dried powderd and passed through the sieve no. 80, and stored for further used in desiccators.

Methodology:

The model drug (sumatriptan succinate) is thoroughly mixed with the mucilage of Hibiscus rosa and then other exipients are added to the mixer and passed through the sieve (sieve no. 40). Collected the powder mixer, blended with magnesium stearate (pre sieved through sieve no. 60), the powder blend is subjected to drying for removal of moisture content and then subjected the blend for tablet compression by using Round and flat faced punches in CADMACH 16 punches tablet punching machine. Punches of 8.7 mm diameter were used for compression. Tablet of 100mg was prepared by adjusting hardness and volume screw of compression machine properly.

Table No. 1: Formulations of Different Batches

Ingredients	F1	F2	F3	F4
Sumatriptan	25	25	25	25
Hibiscus Rosa Mucilage	2.5	5	7.5	10
MCC pH101	63.5	61	58.5	56
Aspartame	4	4	4	4
Magnesium Stearate	3	3	3	3
Aerosil	2	2	2	2
Total Weight	100	100	100	100

*All tablets were weighed in mg

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Evaluation of Pre compressional parameters: [7]

Bulk density: Apparent bulk density was determined by pouring the blend into a graduated cylinder. The bulk volume(V_b) and weight of the powder was determined.

$$\text{Bulk density} = M / V_b$$

Tapped density: The measuring cylinder containing a known mass of powder blend was tapped for a fixed number of times as per USP apparatus-II. The minimum volume occupied by the powder after tapping was measured.

Tapped density = weight/tapped volume

Compressibility index: Compressibility index is calculated as follows.

Tapped density- Bulk density/ Tapped density*100

The value below 15% indicates a powder with good flow characteristics where as above 25% indicates poor flowability.

Haussner's ratio: It is an indirect index of ease of powder flow, it is calculated as follows.

Tapped density / Bulk density

Haussner's ratio <1.25 indicates good flow properties, where as >1.5 indicates poor flowability.

Angle of Repose: Angle of repose was determined using funnel method. The blend was poured through funnel that can rise vertically until a maximum cone height (h) was obtained. Radius of the heap(r) was measured and angle of repose was calculated as follows. The results were shown in table.no.2.

$$\text{ø} = \tan^{-1} \text{h/r}$$

Evaluation of compressed tablets: [8-10]

All the prepared tablets were evaluated for the following parameters as per the I.P guidelines.

1. Organoleptic properties of tablets:

Organoleptic properties such as taste, color, odour, were evaluated. Ten tablets from each batch were randomly selected and tested for taste, color, odour and physical appearance**.**

2. Thickness:

The thickness of individual tablets of 6 numbers were measured with vernier calipers, it permits accurate measurements and provides information of the variation between tablets. Tablet thickness should be controlled within ± 5% variation of standard value.

3. Weight Variation Test:

Twenty tablets from each batch were weighed with electronic digital balance and average weight was determined. Then individual tablets were weighted and individual weight was compared with the average weight. The percentage deviation was calculated and checked for weight variation. Standard deviation was calculated. Using this procedure weight variation range of all the batches were determined and recorded.

4. Friability:

The friability of tablets was determined by using Roche Friabilator. It is expressed in percentage (%). Thirty three tablets (6.600gms.) were initially weighed ($W_{initial}$) and transferred into friabilator. The friabilator was operated at 25 rpm for 4 minutes or run up to 100 revolutions. The tablets were weighed again (W_{final}). The percentage friability was then calculated by,

$$\% \, Friability = \frac{Loss \, in \, weight}{Initial \, weight} \times 100$$

5. Hardness:

The tablet hardness of different formulations was measured using the Monsanto hardness tester for 6 tablets. The tester consists of a barrel containing a compressible spring held between two plungers. The lower plunger was placed in contact with the tablet, and a zero was taken. The upper plunger was then forced against the spring by turning a threaded bolt until the tablet fractures. As the spring is compressed, a pointer rides along a gauge on the barrel to indicate the force. The force of fracture is recorded and the zero force reading is deducted from it. Generally, a minimum hardness of 5 - 7 kg/cm^2 is considered acceptable for uncoated tablets. The hardness for ODTs should be preferably 2-4 kg/cm^2.

6. Wetting time:

The wetting time of the tablets can be measured by using the simple procedure. Five circular tissue papers of 10cm diameter are placed in a petridish. Ten millilitres of water containing a water soluble dye eosin is added to petridish. A tablet is carefully placed on the surface of the tissue paper. The time required for water to reach upper surface of the tablet is noted as the wetting time.

7. Drug Content Uniformity:

Twenty tablets were selected randomly and powdered. A quantity of this powder corresponding to one tablet was dissolved in 100 ml of 6.8 pH phosphate buffer, stirred for 15 min and filtered. 1 ml of the filtrate was diluted to 100 ml with 6.8 pH phosphate buffer. Absorbance of this solution was measured at 226nm using 6.8 pH phosphate buffer as blank and content of drug was estimated.

8. In vitro Disintegration time:

The process of breakdown of a tablet into smaller particles is called as disintegration. The in-vitro disintegration time of a tablet was determined using disintegration apparatus as per I.P. specifications.

I.P. Specifications: Place one tablet in each of the 6 tubes of the basket. Add a disc to each tube and run the apparatus using pH 6.8 phosphate buffer maintained at 37±2C as the immersion liquid. The assembly should be raised and lowered between 30 cycles per minute in the pH 6.8 maintained at 37±2c. The time in seconds taken for complete disintegration of the tablet with no palpable mass remaining in the apparatus was measured and recorded.

9. In vitro Dissolution studies:

Dissolution of the tablet of each batch was carried out using USP type II apparatus (ELECTRO LAB) using paddles at 50 rpm. As per the official recommendation of IP 900ml of 6.8 pH of phosphate buffer used as dissolution medium and the temperature of the medium was set at 37 ± 0.5 ^{0}C. 5 ml of sample was withdrawn at predetermined time interval of 2min., 4min., 6min., 8min and 10min. And same volume of fresh medium was replaced. The withdrawn samples were analyzed by an UV-visible spectrophotometer at 226 nm using buffer solution as blank solution.

RESULTS AND DISCUSSIONS

Table No. 2: Evaluation of ODT for formulations

Formulation	Hardness[a] (kg/cm2)	Friability[b] (%)	Weight Variation[c] (mg)	Thickness[a] (mm)
F1	3.2±0.17	0.26	101±0.59	3.8±0.05
F2	3.4±0.20	0.25	98±0.63	3.9±0.02
F3	3.2±0.18	0.26	99±0.45	3.9±0.07
F4	3.1±0.15	0.24	99±0.88	3.7±0.10

a = 6 tablets, b = 33, c = 20, d=10

All the tablets show similar color, odour, taste and physical appearance. There is no impact of superdisintegrants in their organoleptic properties. By using the superdisintegrants, the hardness values ranged from 3.1±0.15 kg/cm^2 - 3.4±0.20 kg/cm^2 for

formulations. The friability values were found to be within the limit (0.5 - 1%). The above evaluation parameter showed no significant difference between all formulations. The entire tablet passes weight variation test, as the average % weight variation was within thePharmacopeial limit - 7.5%. It was found to be 98±0.63 mg - 103±0.90 mg. The weight of all the tablets was found to be uniform with less deviation.

Table No. 3: Evaluation of ODT for formulations

Formulation	Disintegration time[a] (Sec)	Wetting time[a] (sec)	Drug content[d](%)
F1	54±0.54	27±0.23	98.2±0.62
F2	52±0.63	24±0.47	99.22±0.23
F3	51±0.48	25±0.35	99.4±0.34
F4	48±0.57	22±0.32	99.6±0.56

a = 6 tablets, b = 33, c = 20, d=10

The experiment mimics the action of saliva in contact with the tablet to illustrate the water uptake and subsequent wetting of tablet. This shows the wetting process was very rapid in almost all formulations. This may be due to the ability of swelling followed by breaking and also capacity of water absorption and causes swelling.By using superdisintegrants wetting time was found to be in the range of 22±0.32 - 27±0.23 sec.

Disintegration test carried out in modified dissolution apparatus, all formulations disintegrate in less time i.e ranges between 48±0.57 to 54±0.54. The concentration of the drug in all the formulations with superdisintegants was found to be 98.2±0.62 to 99.6±0.56. It was within the IP limits. The results of drug content of all batches are shown in

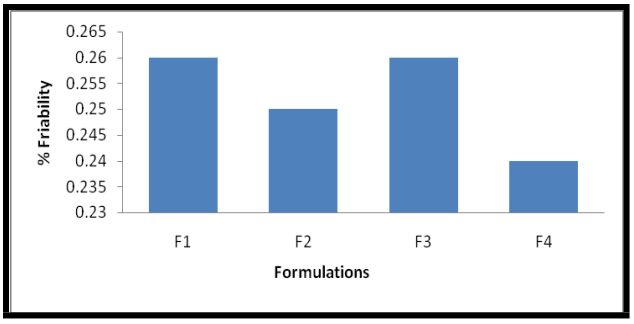

Fig. 1: Bar graph comparison friability for formulations

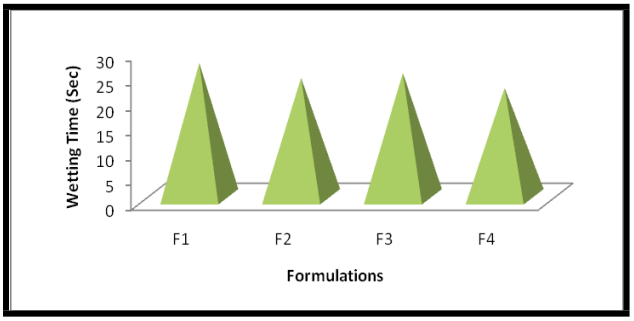

Fig. 2: Bar graph comparison between wetting time for formulations

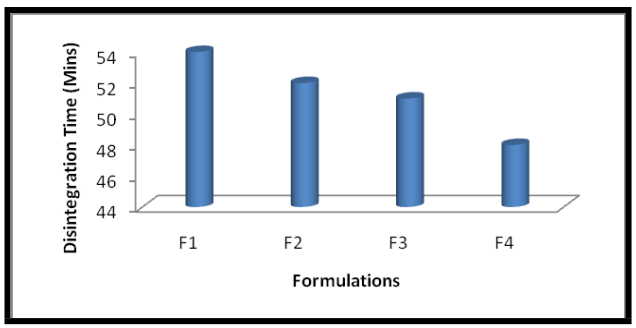

Fig. 3: Bar graph comparison between Disintegration time for formulations

Dissolution Studies:

Table No. 4: Cumulative % drug release for formulations

	F1	F2	F3	F4
2Mins	42.64±0.88	38.24±0.32	40.24±0.82	40.24±0.26
5Mins	55.36±0.62	51.18±0.62	52.48±0.90	58.62±0.58
10Mins	67.28±0.24	65.28±0.42	66.32±0.48	78.68±0.46
15Mins	78.62±0.68	79.57±0.48	75.88±0.62	90.42±0.28
20Mins	90.64±0.44	91.58±0.18	86.22±0.94	99.24±0.84
30MIns	98.24±0.	99.62±0.62	98.72±0.52	

n=6

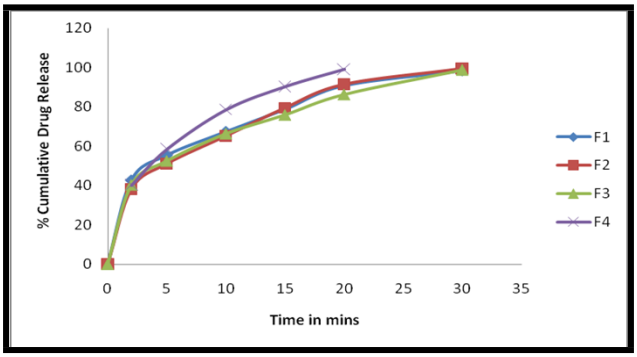

Fig. 4: Linear graph comparison between cumulative % drug release for formulations

Dissolution is carried out in USP apparatus type-2 apparatus at 50rpm in 900ml dissolution media (phosphate buffer pH 6.8) for 30 minutes. At the end of 20 minutes almost total amount of the drug is released (i.e. 99.24±0.84) from the formulation prepared by the direct compression method with 10% Natural Polymer. The results were shown in table.no.7.6 and comparative profiles were shown in fig.No.7.10.

SUMMARY

The aim of the present study was to develop and optimize oral disintegrating tablets of drug (sumatriptan) to give quick onset of action by rapidly disintegrating in a few seconds without the need of water with better patient compliance. In such cases, bioavailability of drug is significantly greater and adverse event is reduced than those observed from conventional tablet dosage form. By performing compatibility studies by IR spectrophotometry, no interaction was confirmed. Oral disintegrating tablets were formulated by direct compression method and evaluated by UV-Visibile spectrophotometer. Standard calibration curve prepared to determine the drug content in the prepared tablets. Prior to compression, the blend of drug and excipients were evaluated for flow properties such as Angle of repose, Bulk density, Tapped density, % Compressibility, and Hausner ratio. All the formulation showed good flow properties. Oral disintegrating tablets were prepared by direct compression technique using CADMACH 16 station tablet punching machine, equipped with round flat punches of 8 mm diameter. Post compression evaluation of prepared oral disintegrating tablets were carried out with the help of different pharmacopoeial and non-pharmacopoeial (industry specified) tests. The shape and color of all the formulations were found to be circular and white in color. The thickness was found to be uniform in specific formulations. The hardness and friability are also within the permitted limits. Dissolution of tablets was carried out.

CONCLUSION

The above results suggest that the formulated oral disintegrating tablets of sumatriptan by using mucilage of hibiscus rosa sinesis exhibited good physical parameters and rapidly disintegrating without affecting the release profile and is very effective in case of elderly and pediatric patients. The overall results indicated that formulation with natural polymer (10%) had a higher edge compared to other formulations. They satisfy all the criteria for oral disintegrating tablets. This direct compression process is

simple, reproducible and robust to prepare orally disintegrating tablets of sumatriptan succinate and other anti-migraine drugs.

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REFERENCES:

1. Seager H. Drug delivery products and the zydis fast dissolving dosage forms, J. Pharm. Pharmacol., **1998**; 50(4): 375-382.
2. Indurwade N.H, Rajyaguru T.H and Nakhat P.D. Fast Dissolving drug delivery systems: A Brief overview, Indian Drugs, **2002**; 39(8): 405-09.
3. Devrajan P.V, Gore S.P. Fast Dissolving Tablets: The Future Compaction, Express Pharma Pulse, **2000**; 23, 7(1): 16.
4. Habib W, Khankari R, Hontz J. "Fast-dissolving Drug Delivery Systems", Critical Reviews ™ Therapeutic Drug Carrier Systems, **2000**; 17(1): 61-72.
5. www.drugbank.ca
6. Handbook of excipients, Rowe.R.C, shestey P.J, Weller P.J Hand book of pharmaceutical excipients, 6th edition, london, Chicago: Pharmaceutical press, American pharmaceutical association; **2009**.
7. Sudheshnababu et al, Formulation and evaluation of fast dissolving tablets of Amlodipine Besylate by using Hibiscus rosa-sinesis mucilage and modified gum karaya, Int. J. Pharma. Sci. and Res., **2012**; 3(10): 3975-3982.
8. Rajeshree Panigrahi, K.A.Chowdary, Gitanjali Mishra, Manas Bhowmik. Effect of Combination of Natural Superdisintegrants on Fast Dissolving Tablets of Lisinopril, Int. J. Pharma. Res. and Allied sci., **2012**; 1(3): 73-78.
9. Sunada H, Bi Y. Preparation, evaluation andoptimization of rapidly disintegrating tablets, Powder Technol., **2002**; 122(23): 188-198.
10. Abhishek Sonil et al., Formulation and Evaluation of Fast disintegrating Tablets containing Hydrochlorthiazide, Ind. J. Pharma. and Pharmacol., **2015**; 2(2): 119-133.

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