DEVELOPMENT AND EVALUATION OF FAST DISSOLVING TABLET OF BECLOFEN USING FENUGREEK SEED MUCILAGE

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ABSTRACT:- Over the last two to three decades, there has been a notable growth in the demand for pills that dissolve quickly. In this study, the effects of conventional, synthetic, and natural superdisintegrants are compared in the formulation of Beclofen-containing fast-dissolving tablets. Beclofen, a new anti-migraine drug, is a potent and specific 5-hydroxytryptamine1B/1D receptor agonist that is thought to be more effective than traditional triptans at treating acute migraine attacks. Using superdisintegrants, nine Beclofen fast-dissolving tablet (FDT) formulations were made and examined against official guidelines, meeting all requirements. Using the direct compression approach, many formulations were created using four different superdisintegrants: sodium starch glycolate, crospovidone, and the natural superdisintegrant fenugreek powder, at three concentrations (4%, 6%, and 8%). In vitro dissolution tests showed that formulation FL5 achieved 98.50% drug release in 3 minutes, and it also showed the quickest disintegration time.

Keywords:- hydroxytryptamine, fenugreek powder, beclofen, crospovidone, migraine, natural superdisintegrants, and dissolution time.

INTRODUCTION:-

Due to its simplicity of self-administration, small size, accurate dosing, and convenience of manufacturing, the tablet is the most widely used traditional solid dosage form. However, a major drawback is the swallowing difficulties that both elderly and young patients face. Extra water is not necessary because the quickly dissolving pills dissolve in a matter of seconds when they come into contact with saliva. Improved bioavailability, increased patient acceptance, and a quick beginning of action are some advantages of fast dissolving tablets (FDTs).[1-4]

Beclofen, a new anti-migraine drug, is a potent and specific 5-hydroxytryptamine1B/1D receptor agonist that is thought to be more effective than traditional triptans at treating acute migraine attacks. 3-[2-(dimethylamino)ethyl]-5-(1H1,2,4-triazol-1-ylmethyl)indole monobenzoate is the chemical composition. Beclofen benzoate has a bioavailability of about 45%, which is higher than the insufficient 14–17% of similar triptan drugs. It provides immediate relief from migraines and starts working within 30 minutes of intake. [4-7]

MATERIALS AND METHODS:

MATERIAL:

Ayursatva, Madhya Pradesh, supplied the fenugreek powder; Sweetener India, Delhi, supplied the aspartame; Ultra Drugs Limited, Himachal Pradesh, offered the beclofen as a gift sample; and Central Drug House supplied the other analytical-grade chemicals and reagents.

Methods

Beclofen fast-dissolving tablets were made using the precise amounts of the drug and excipients listed in Table No. 1. Magnesium stearate and talc powder were then added and properly blended after the precise amounts of aspartame and super disintegrants for each formulation were measured and mixed. A 10-station tablet punching machine was used to condense the drug and excipient mixture. Angle of repose, bulk density, tapped density, compressibility index, and Hauser's ratio were among the pre-compression characteristics that were applied to the mixture blend of all formulated designs in order to prepare the tablets.

Pre-formulation investigations:

Repose Angle (θ): Scientist Newman's funnel method is used to determine the angle of repose. The following formula is used to determine the angle of repose.

Density in bulk:Mass per unit volume is the definition of density. The mass of the powder divided by its bulk volume, measured in grammes per cubic centimetre (g/cm2), is known as the bulk density. The bulk density can be divided into two groups.

Density Tapped (Dt): The measure that compares the powder's total mass to its tapped volume. The powder was tapped 500 times to measure the volume, and the tapped volume was recorded as long as there was a 2% or less discrepancy between the two volumes. It was displayed as follows in g/ml:

Mass (M) divided by volume (Vt) yields density (Dt).

While Vt indicates the powder's tapped volume, M stands for the powder's mass.

The percentage compressibility, often known as Carr's index:

The powder flow properties are evaluated by the Carr's index. It is computed as follows and displayed as a percentage:

Dt × 100 = (Dt - Db) / Dt

In this case, Dt stands for the powder's tapped density.The powder's bulk density is denoted by Db.11

The Hausner ratio: An indirect indicator of the flow properties of powders is the Hausner ratio. The following formula is used to carry out the calculation:

The Hausner ratio is equal to Dt/Db, where Db is the bulk density and Dt is the tapped density.Superior flow characteristics are indicated by a lower Hausner ratio (<1.25) as opposed to greater ratios (>1.25).

Evaluation /Investigation of the tablet:

Every Beclofen tablet formulation was evaluated using the standards specified in the IP guidelines; all results are shown in Table No. 3.

Weight Variation: To determine their weight, twenty Beclofen formulation pills were selected at random from each batch and weighed separately on a digital balance. It was found that the tablets' computed average weight fell within the acceptable range.

HARDNESS:The Monsanto tablet hardness tester was used to determine how hard the Baclofen tablet was.

THICKNESS:Vernier Callipers were used to measure the tablet thickness in millimetres for each batch that was formulated.

FRIABILITY A USP type Roche friabilator was used to evaluate the friability of a sample of twenty Beclofen tablets. After reweighing the tablets, the percentage of weight loss was calculated and found to be between 17 and 18.

(Initial Weight - Final Weight) * 100 / Initial Weight = Friability (%)

DISINTEGRATION TIME: Six Beclofen tablets were used in a disintegration time study that used a disintegration test with 900 millilitres of distilled water at 37°C ± 2°C.

Test of Dissolution:

The USP dissolution test equipment type 2, also referred to as the paddle dissolution apparatus, was used for the in vitro dissolution investigation. The dissolution medium was a phosphate buffer with a volume of 900 ml and a pH of 6.8, which was kept at 37±0.5°C in compliance with conventional protocols.[20–21]

Table No. 1:- Formulation of fast dissolving tablet of Beclofen:

Ingredients(mg)	FL1	FL2	FL3	FL4	FL5	FL6	FL7	FL8	FL9
Beclofen	8	8	8	8	8	8	8	8	8
Cross carmellose Sodium	3	6	9	-	-	-	-	-	-
Fenugreek Mucilage	-	-	-	3	6	9	-	-	-
Sodium starch glycolate	-	-	-	-	-	-	3	6	9
Aspartame	3	3	3	3	3	3	3	3	3
Flavour	3	3	3	3	3	3	3	3	3
Talc	3	3	3	3	3	3	3	3	3
Magnesium Stearate	3	3	3	3	3	3	3	3	3
Mannitol	40	40	40	40	40	40	40	40	40
Lactose	45	45	45	45	45	45	45	45	45
MCC	42	39	36	42	39	36	42	39	36
TOTAL	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**

RESULT AND DISCUSSION:-

Table No. 2:- Pre-compression parameters of BeclofenFDTs

Parameters / Formulation	Bulk Density (mg/ml)	Tapped Density (mg/ml)	Hausners Ratio	Compressibilty Index (%)	Angle of Repose 0
FL_1	0.461±0.011	0.511±0.015	1.108±0.090	09.78±0.15	24.11±1.38
FL_2	0.463±0.031	0.523±0.011	1.129±0.089	11.47±0.03	25.22±1.35
FL_3	0.455±0.017	0.516±0.013	1.134±0.019	11.82±0.18	24.25±1.40
FL_4	0.471±0.014	0.539±0.011	1.144±0.015	12.61±0.05	24.47±0.55
FL_5	0.482±0.011	0.551.±0.012	1.143±0.021	12.52±0.03	28.01±1.25
FL_6	0.481±0.021	0.561±0.016	1.166±0.025	14.26±0.19	24.29±1.17
FL_7	0.468±0.19	0.525±0.015	1.121±0.019	10.85±0.15	25.39±0.15
FL_8	0.465±0.018	0.535±0.013	1.150±0.0.29	13.08±0.05	26.25±0.29
FL_9	0.485±0.011	0.574±0.012	1.183±0.025	15.50±0.16	24.42±1.10

Table No. 3:- Post-Compression parameters of Beclofen FDTs:

Parameters / Formulation	Weight (mg)	Hardness (Kg/cm^2)	Friability (%)	Disintegration Time (Sec)	Swelling Time (Sec)
FL_1	155.05±0.51	4.15±0.15	0.51±0.24	58±1.24	15±1
FL_2	145.57±0.71	3.11±0.01	0.55±0.21	42±1.14	14±2
FL_3	148.01±0.15	3.31±0.09	0.56±0.17	55±1.26	16±1
FL_4	153.02±0.21	3.55±0.12	0.51±0.15	53±1.25	21±1
FL_5	149.19±0.19	3.51±0.01	0.62±0.12	40±1.22	13±2
FL_6	154.05±0.35	3.29±0.10	0.71±0.32	49±1.31	17±2
FL_7	146.01±0.15	3.35±0.05	0.63±0.13	65±1.01	13±2
FL_8	155.50±0.04	3.50±0.09	0.62±0.20	42±1.19	22±2
FL_9	152.02±0.21	3.40±0.18	0.68±0.11	41±1.18	13±1

Table No. 4:- Drug Content in the Fast Dissolving Tablet of Beclofen

Parameters / Formulation	Drug Content (mg per Tablet)	% Drug Content
FL_1	140.51±0.02	93.67
FL_2	142.83±0.04	95.22
FL_3	141.65±0.12	94.43
FL_4	145.25±0.13	96.83
FL_5	147.75±0.15	98.50
FL_6	146.27±0.21	97.51
FL_7	143.23±0.18	95.48
FL_8	145.14±0.14	96.76
FL_9	144.85±0.20	96.38

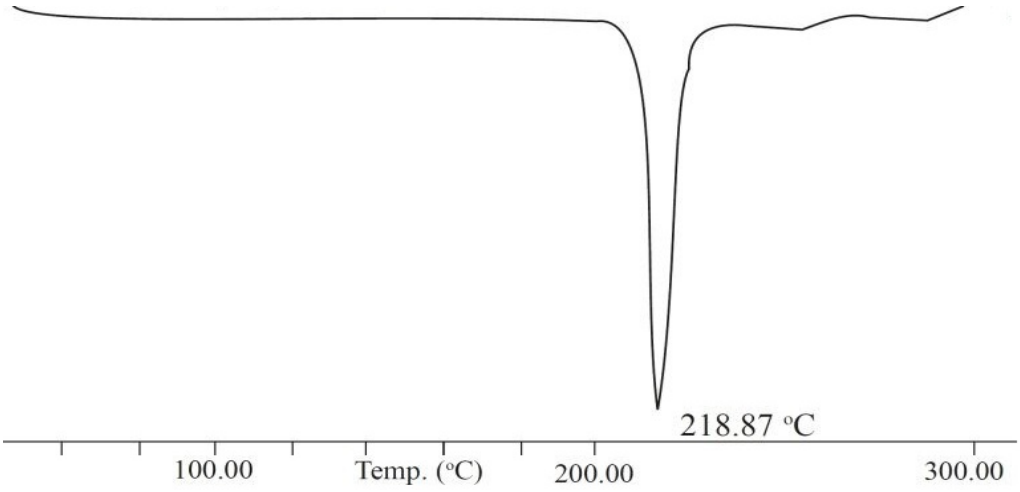

Figure 1: DSC Thermogram of Beclofen

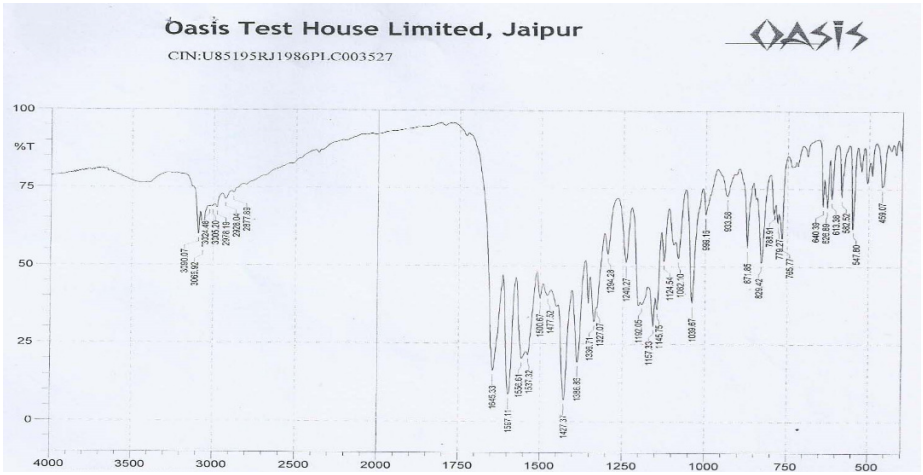

Figure 2: IR Spectra of Beclofen

RESULTS AND DISCUSSION:

The Blend was found to have a bulk density of 0.455±0.017 to 0.485±0.011 and a taped density of 0.511±0.015 to 0.574±0.012, respectively. Hausner's factor values range from 1.108±0.090 to 1.183±0.025, which is consistent with the developed blend's Carr's index, which ranges from 09.78±0.15% to 15.50±0.16%. As a result, the mixes that have been created have outstanding flow properties and can be used to make tablets. The range of results for the angle of repose was 24.11±1.38 to 28.01±1.25.

Parameter for Post-Compression

Similar experimental conditions were used to make each tablet. Each composition was white, odourless, flat, and had surfaces that were almost smooth. The fast-dissolving pill's mean weight varied between 145.57±0.71 and 155.50±0.04 mg. The generated tablet's hardness varied between 3.11±0.01 and 4.15±0.15 kg/cm². All of the formulations'

hardness and friability fall within acceptable levels, as seen by the percent friability, which varied from 0.510.15 to 0.710.32 (less than 1.0%). It is crucial that the disintegration time be less than one minute. The quick breakdown could improve the medicine's bioavailability by facilitating quick swallowing and medication absorption in the buccal cavity. The quick dissolving tablet's disintegration time varied between 40 and 65 seconds. The swelling time is a gauge of how easily the tablet dissolves in the buccal cavity. The pill's swelling time varied from 13 to 21 seconds. The kind of superdisintegrants used affected how much the pills swelled. The generated formulation's assay, which evaluated the homogeneity of the drug content, yielded results ranging from 93.67% to 98.50%. Using phosphate buffer at pH 7.4 as the dissolution medium and a dissolution test apparatus set to a paddle speed of 50 rpm, an in vitro dissolution study was carried out. For FL5, FL6, FL4, FL8, FL9, FL7, FL2, FL3, and FL1, the cumulative percentage of drug release from multiple fast-dissolving Beclofen tablets was 98.50%, 97.51%, 96.83%, 96.76%, 96.38%, 95.48%, 95.22%, 94.43%, and 93.67% after 5 minutes.

CONCLUSION:

According to the study's findings, Beclofen is offered as a fast-dissolving pill. Pharmaceutical excipients for the oral delivery of medications can be natural superdisintegrants. Using fenugreek powder, the maximum percentage of drug release for formulation FL5 was found to be 98.50%. According to the study, natural superdisintegrants like fenugreek powder have better disintegration qualities than synthetic ones like crospovidone (CP) and sodium starch glycol (SSG). Therefore, because of its non-toxic nature, affordability, biodegradability, biocompatibility, and lack of adverse effects, fenugreek powder can be used at higher quantities.

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