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FORMULATION AND EVALUATION OF SUSTAINED-RELEASE TABLET HAVING GENISTEIN

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Keywords:

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ABSTRACT: Genistein is phytoestrogens that function on estrogen receptors through a receptor-dependent mechanism. Genistein is commonly used to alleviate menopause symptoms, lower breast cancer risk, protect against prostate problems, improve bone health and lower the risk of heart disease. This research aims to create Genistein oral tablets with a long release time. In a rotary tableting machine, tablets were made using the Wet Granulation technique. *In-vitro* release studies were conducted using a 1% SLS aqueous solution in a Paddle apparatus (USP Type-II apparatus) for 120 min at 37 + -05 °C and 100 RPM. The formulation containing Methocel K 100 LV and K4M was found to be the best based on dissolution results. The formulations were tested for stability according to ICH guidelines and were found to be stable during the sample. Flow properties, Carr and Hausner indexes, hardness, friability, disintegration time and drug release profile were among the parameters tested on powder, granules and tablets. In addition, a quick and reliable HPLC analytical method for Genistein has been developed.

INTRODUCTION: The use of herbal products as medicinal agents has grown in popularity as a result of scientific advancements. Isoflavones are among the most researched plant constituents due to their estrogen-like activity without the typical side effects of hormonal therapy. Isoflavones have also been widely used to treat menopausal symptoms as well as to prevent hormone-related cancer, osteoporosis and cardiovascular disease [1]. Isoflavones are commonly used and are now available in the form of over-the-counter vitamins, pills, and tablets.

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Isoflavone tablets have become very common for postmenopausal treatments due to the numerous advantages of oral delivery types, such as comfort and enforcement. However, since herbal materials have poor flow capacity and low compressibility, developing solid dosage forms from plant raw materials is a difficult job [2].

Furthermore, the most common isoflavones present in soybean extracts (Genistein, Daidzein, and Glycitin) are poorly water-soluble and have low membrane permeability, posing a challenge production of oral dosage forms [3]. Non-standardization of soy isoflavone extracts and various dissolution profiles of solid dosage types may be the key causes of these variations. Despite the widespread use of isoflavones as phytomedicines, there have been few studies on the production of isoflavone tablets. Until recently, the majority of the issues centered on the

standardization extract, with little emphasis on the production of pharmaceutical types. The current study focused on the formulation and technical parameters of Genistein tablets.

Direct compression or wet granulation was used to make tablets with various disintegrating agents, surfactants, and diluents and the effects of these techniques were assessed. Genistein, Daidzein, and their metabolites are the main isoflavones found in soy [4].

Isoflavones are part of the flavonoid family of entombing compounds, which has a strong aesthetic shape a ramification as for the constituents known as polyphenols [3]. Flavonoids are naturally occurring chemicals with varied phenolic structures found in fruits, vegetables, cereals, bark, roots, stems, flowers, tea, and wine. These natural compounds are widely known for their health benefits, and attempts are being undertaken to isolate the chemicals known as flavonoids. Because genistein and daidzein are known to block critical enzymes in the steroid metabolism pathway, they may alter active oestrogen levels. Chick pea (biochanin A), alfalfa (formononetin), and peanuts are also good sources of isoflavones (genistein).

Isoflavones accept global transfiguration in the same way as the duodenal continues until absorption. Abdominal bacterial glucosidases engulf lamb moieties, releasing the biologically active isoflavones Genistein and Daidzein. When it comes to soy to animals, isoflavone metabolites are depleted even more in oil refinery products and meat [3].

Genistein is intrusive at a humble-looking monastic analysis. Genistein was lost in ultra inward over personality subjects federal agent a satisfying soy soda. Isoflavones are entered into the liver after absorption; the profitability of this hepatic first-pass interest payment affects the deal that enters parametric tissues. Genistein which are present in soya isoflavones are phytoestrogens that work by inhibiting estrogen-receptor-dependent mecha-nisms. Phytoestrogens bind to estrogen receptors and function as estrogen agonists and antagonists, depending on circulating estrogen levels, and mimic the estrogen proposal before garden sculpture throughout menopause [1, 6].

MATERIALS AND METHODS: Genistein is obtained from YUCCA Enterprises, Mumbai. DOW Chemicals provides Methocel K100LV and K4M, while Nitika Chemicals in Nagpur provides magnesium stearate. TATA Chemicals is a supplier of sodium carbonate. Accent Microcell Industries in Ahmedabad produces Micro Crystalline cellulose. Cobot Chemicals manufactures colloidal silicon dioxide, Godrej Industries manufactures sodium Lauryl Sulphate, Deepak Fertilizers manufactures isopropyl alcohol, and BSF manufactures polyvinyl pyrrolidone.

In the Instruments, there is a measuring balance, a Solace Fluid Bed dryer, a Solace Rapid Mixture Granulator, a Veego programmable melting point apparatus, a Camp bell electronics Monsanto Hardness Tester, a J.S enterprise Friability Test apparatus, and a Veego programmable melting point apparatus. Shimadzu FTIR Spectrophotometer, Rimek Tapped Densitometer, Elite Single Rotary Tablet Compression Machine from Ahmedabad, Techno Starch KBr Instrument Allianz HPLC Waters e 2695 separation modules Fluidpack's Multi mill, Sehgal Industrial Works' Octagonal blender mixer, Mitutoyo's Vernier Calliper and Electro Lab Company's Dissolution tester USP (type II) is used.

Preformulation Studies: Preformulation can be described as a consideration of the persecution and follow-up method. Harmony straightens up until puff stable, undaring, and willing dosage type, where the formulation scientist characterizes the physical, acetone, and impersonal properties of an immediate knock-out drug. Preformulation entails the rigorous application of biopharmaceutical cleanness concerning physicochemical parameters re knock stiff treasure, which was described as the payoff for a politic optimal proprietary name transfer method [7].

Shimadzu FTIR-8700 spectrophotometer was used in this experiment. Potassium bromide discs were used in this analysis. Pure drugs and physical mixtures were investigated in the infrared spectrum. Potassium bromide, dry powder, was thoroughly mixed with the powdered sample. Using special dies, the mixture was compressed into a transparent disc under high pressure. The sample pellets were placed in a holder and scanned

with a Shimadzu Fourier Transform Infrared Spectrophotometer between 400 and 1950 cm^{-1}. Melting point: The melting point apparatus was used to calculate the drug's melting point. Loss on drying: The test was carried out by putting 1.0 gm of sample in a 105 °C oven for 2 h and then weighing it again; the sample lost no more than 5.0 percent of its weight. The following formula was used to measure the percent loss due to drying [8].

% Loss on Drying = (Initial weight - Final weight/ Initial weight) × 100

Solubility Testing: The sample drug was dissolved in 3 ml of different polar and non-polar solvents (Methanol, ethanol, acetone, water, and glacial acetic acid) until it reached saturation. In a stirrer, hold the solution for 24 h. The sample will be spectrophotometrically analyzed by a UV spectrophotometer after 24 h. HPLC9, which stands for High-Pressure Liquid Chromatography with Adsorption and Partition Coefficient, is a division technique that includes: the infusion of a small volume of fluid as an example. Into a stationary point, which is a tube filled with small particles measuring 3 to 5 microns in diameter. These segments were separated from one another using segment pressing, which involves a variety of compounds as well as physical interactions between their atoms and the pressing particles. A course via gadget (locator) that measures the sum of these isolated segments was used to identify them at the tube's exit (section). A "fluid chromatogram" is a yield from this identifier.

Pump: The pump's job is to push a fluid (referred to as the portable stage) through the fluid chromatography at a specific stream rate, which is expressed in milliliters per minute (mL/min). In HPLC, standard stream rates range from 1 to 2 mL/min. Pumps with average pressures of 6000-9000 psi can reach weights in the range of 6000-9000 psi (400-to 600-bar). During the chromatographic examination, a pump may move an expanding portable stage piece or a stable flexible stage structure (isocratic) (inclination).

Injector: The injector is used to introduce the fluid example into the flexible phase's stream. Test volumes range from 5 to 20 microliters (L). The injector should also be able to withstand the fluid framework's high weights. When a client has a large number of examples to analyze or when the manual infusion is not possible, an autosampler is used. The segment's stationary point, also known as the "heart of the chromatograph," isolates the example segments of enthusiasm using various physical and synthetic parameters. At normal stream speeds, the small particles within the section are what trigger the high back weight. To pass the portable stage through the segment, the pump has to exert a lot of force, which results in a lot of weight inside the chromatograph. This uses a prepared straight section of Silica pressing that is 15 to 150 cm long and 2 to 3 mm wide.

Detector: The identifier will classify the individual atoms that emerge from the section (elute). A finder is used to determine the size of certain atoms so that the physicist can analyze the example segments quantitatively. The identifier provides a yield to a recorder or a computer, which results in a fluid chromatogram (*i.e.*, the chart of the indicator reaction).

Computer: Also known as the information system, the PC not only controls all of the modules of the HPLC instrument, but it also takes the flag from the finder and uses it to determine the season of elution maintenance time of the example segments subjective investigation) and the test volume quantitative examination.

Preparation of Mobile Phase: The quantity of 0.1 percent acetic acid in the water, filtered and sonicated in mobile step A. Mobile step B-0.1 acetic acid in acetonitrile, filtered and sonicated. Genistein is typically prepared in the following way: Move about 50 mg of Genistein standard into a volumetric flask with a 50 ml capacity. Using a sonicator, dissolve 25 mL of methanol, then dilute with methanol to amount. Pipette 5 mL from this and dilute with methanol to 50 mL.

Sample Preparation: Weigh 50 mg of the sample accurately and move to a 50 mL volumetric flask. 25 methanol, sonicate to dissolve, then dilute with methanol to length. Pipette 5 mL from this and dilute with methanol to 50 mL.

Chromatography System: A 254-260 nm UV detector and a 4.0 mm × 250 mm C18 (Merck/Supeleo) Column are used in the liquid Chromatogram.

Chromatograph the standard preparation and record the peak response as guided in the protocol, with a relative standard deviation of no more than 1.0 percent for replicate injection.

Procedure: Inject equivalent amounts of the normal and sample preparations into the chromatograph separately (about 20l), record the chromatograms, and calculate the responses for the peaks corresponding to Genistein.

Method of Preparation: Wet Granulation Technique 10 was used to create the tablet. Granules are formed by restricting the powders together with adhesive rather than compaction in this technique. The dissolvability of the cover and the blend segments are used in the presentation technique. The mass should be moist. In this method, Diluents (Microcrystalline cellulose, anhydrous Dibasic Calcium Phosphate) were mixed with API and HPMC K-100M and HPMC K-4M in a Rapid mixer. The granulator and paste of PVP binding agent and granulating agent (isopropyl alcohol) prepared in the kettle machine were slowly applied to the RMG and blended for 15 min to an h. To decide the granule endpoint, press a portion of the mass in the palm of your hand and sieve from around # size no. 10; if the ball crumbles under moderate pressure, the mixture is ready for the next step, Wet Screening. A multi mill is used to transform the moist mass into coarse during the wet screening process. After that, the granules should be dried in a Fluid Bed Dryer at a temperature of 55-60 °C for 1 h to achieve the optimal degree of concentration within the granules and sieved no. 16/22 was used to make uniform granules.

After drying, the granulation was screened again using a mechanical shifter, and size reduction was accomplished using a Cad Mill with a sieve size of 16 and lubricants (Magnesium Stearate, Colloidal Silicon Dioxide) were applied to an Octagonal Blender, and mixing was completed before the bulk was produced for compression [11]. The quantity and ingredients used in formulations as shown in **Table 1**.

TABLE 1: DIFFERENT FORMULATION FOR MAKING TABLET

Ingredients	F1	F2	F3	F4	F5
Genistein	75.75gm	81.900gm	78.9gm	76.900gm	76.9gm
Sodium Carbonate	17.5 gm	17.500gm	18.5gm	17.500gm	17.5gm
Methocel K100LV	35.0gm	15.00gm	24.0gm	35.00gm	29.0gm
Dicalcium Phosphate	15.0gm	17.00gm	16.0gm	12.00gm	14.0gm
Microcrystalline Cellulose	27.49gm	26.630gm	27.63gm	21.630gm	25.63gm
PolyVinyl pyrrolidone K30	2.630gm	2.630gm	2.63gm	2.630gm	2.63gm
Magnesium Stearate	1.75gm	1.75gm	1.75gm	1.75gm	1.75gm
Isopropyl Alcohol	-	-	110ml	110ml	110 ml
Colloidal Silicon Dioxide	0.875gm	0.875gm	0.875gm	0.875gm	0.875gm
Sodium Lauryl Sulphate	1.75gm	1.750gm	1.75 gm	1.750gm	1.75 gm
Methocel K4M	-	13.752gm	6.5gm	8.752gm	7.5gm
Total	177.75gm	178.787gm	178.35gm	178.787gm	177.35gm

Evaluation: Pre Compression before using the following parameters: The Repose Angle is defined as the angle at which the body is held in a Because of the frictional forces between the particles, a powder stream is recommended.

The edge of rest can be used to measure the frictional strength of free powders and granules. Between the surface of a heap of powder or granules and the flat plane, this is the most extreme edge imaginable. The lower the rest points, the better. The edge of rest was determined using Repo so graph. The system is made up of a smaller-than-normal container with a base stage that is divided into zones. The small-scale container was overflowing with the measure, which was allowed to flow freely through the opening under gravity. The cone-shaped base was inspected to keep an eye on the zone and determine the granules' flowability. The recipe can be used to calculate it. h/r tan tan tan tan tan tan tan Where h denotes height. r = radius, e = resting edge [11, 12].

Bulk Density: The tapped mass thickness (TBD) and the free mass thickness (LBD) were both resolved. In the Tap densitometer, a quantity of 10 gm of powder should be added to the starting volume of 19 ml in the calculating barrel and so on.

Compressibility Index: Carr's Compressibility file was used to monitor the granules' compressibility list. Tapped thickness - Bulk thickness × 100 = Carr's Index

Post-Pressure Parameters: Tablets-Matrix tablet shading and state were investigated using a focal point for the shape and shade of tablets.

Thickness and Width: Tablet thickness and distances through tests provide precise measurement and data on tablet variety. With the aid of a Vernier-caliper, the thickness and distance over ten tablets are measured. The thickness and width of the tablet should be held within a 5-percentage-point range of normal value.

Weight Variation Test: To search for weight variation, 10 tablets were randomly selected from each detail and measured separately. The United States Pharmacopeia allows for some variation in the weight of a tablet. According to the Indian Pharmacopeia, a 5% difference is allowed.

Hardness Test: Hardness shows how well a tablet can handle mechanical shocks when being cared for. A Monsanto hardness tester was used to determine the tablet's hardness. It is expressed in kilograms per square meter. Ten tablets were chosen at random from each definition, and the mean and standard deviations were calculated.

Friability Test: A Roche friabilator was used to monitor the friability. It is conveyed at a rapid pace percent. At first, ten tablets were weighed and placed in the Friabilator. The Friabilator was set to 25 rpm and allowed to run for up to 100 unrests. The tablets were measured once again. The formula was then used to calculate the percent friability.

% F = Initial Weight - Final Weight/Initial Weight × 100 weight of the tablets % friability under 1% is viewed as worthy

Consistency of Weight: This test was done to maintain the consistency of weight of each tablet that should be in the recommended dosage.

It was completed by inspecting and weighing 20 tablets randomly and determining the average weight. Not more than two of the individuals' weights deviate from average by more than the rate, and none by more than twice the rate.

The standard deviation and mean were determined [13]. The weight variation scale was given in **Table 2**.

TABLE 2: AVERAGE WEIGHT VARIATION SCALE

S. no.	Average Weight	% of Deviation
1	80 mg or < 80	10
2	>80 to < 250 mg	7.5
3	>250 or more	5

Dissolution Apparatus Type II (USP): Compose II disintegration system was used to *complete in-vitro* discharge ponders. Using the disintegration test mechanical assembly USP write II, *in-vitro* disintegration studies of assisted discharge tablet plans of Genistein as a dose frame were conducted. The situation was improved after a disintegration investigation of the Genistein-managed discharge tablet. 12 h out of 900 ml medium water + 1% SLS for F1, F2, and F3 clusters, then search in Buffer pH 6.8 + 1% SLS using USP disintegration mechanical assembly Type 2(Paddle) at 50 rpm while maintaining the temperature of the media at 370.5 °C.

Dissolution thinking was done in Medium 1 percent SLS in phosphate cushion for the F4 category. The dissolution of F5 clumps was first investigated in Medium Buffer pH 6.8 + 1% SLS for 12 h and then in Medium Water + 1% SLS for another 12 h. Solidity ponders, the ability of a specific detailing in a specific holder, to remain within its physical, synthetic, beneficial, and toxicological requirements is referred to as drug stability. Soundness testing aimed to demonstrate how the nature of a drug substance or medication item changes over time as a result of a variety of environmental factors such as temperature, humidity, and light and to allow suggested capacity conditions, re-trials, and usability time spans to be established. The duration of the research and the ability are determined by the ICH. 3 months Real-Time Stability Studies (temp. 30 °C ± 2 °C and RH 65% ± 5%) 3 months Accelerated Stability Studies (temp. 40 °C ± 2 °C and RH 75% ± 5%)

Procedure: In this study, security considerations were completed for selected formulations over three months for a specific age. The following parameters were examined for the chosen plans: Examination of the Physical Appearance: Each week, the chosen tests were tested for any shading changes Hardness.

The chosen measurements were put to the test for material hardness. Observation Content of medication: The chosen plans were examined for sedatives. Medication Discharge Considerations: The selected specifics were subjected to sedative discharge considerations. The realistic usability constraint for Genistein tablets is (not less than) NLT 90 mg/tab and (not more than) NMT 110mg/tab, respectively, or NLT 90 percent and NMT 110 percent of mark guaranteed [11, 12].

RESULT AND DISCUSSION: Using the wet granulation method, a total of five formulations containing 150 mg of Genistein were generated in the current study. Only the polymer Methocel K100LV was tested in the F1 batch and its release profile was verified in dissolution medium water + 1% SLS and then in Medium Buffer pH 6.8 + 1% SLS. F2, F3 and F4 batches of Methocel K100LV and Methocel K4M in a 15:14, 18:7 and 35:9 ratio in a dissolution medium of 1% SLS in phosphate Buffer. The F5 batch includes the polymers Methocel K100LV and K4M in a 29:8 ratio and the release analysis was conducted first in medium Buffer Ph 6.8 + 1% SLS and then in Medium + 1% SLS. Each formulation's complete composition is given. Various evaluation parameters are applied to these formulations.

Preformulation Studies: Table 3. and 4 shows the initial observations of drug and Flow Properties of API and other excipients

TABLE 3: DRUG OBSERVATIONS

S. no.	Parameters	Drug (Genistein)
1.	Appearance	Tan granular Powder
2.	Colour	Brown Colour
3.	Odor	Characteristic
4.	Taste	Typical
5.	Solubility	Dispersible in Water

Flow Properties:

TABLE 4: FLOW PROPERTIES

Angle of repose	>40 °
Bulk Density	0.53101
Tapped Density	0.7761
Carr's Index	0.3158
Hauser's ratio	0.24509

Drug identification was accomplished by the use of FTIR and the determination of the drug's melting point.

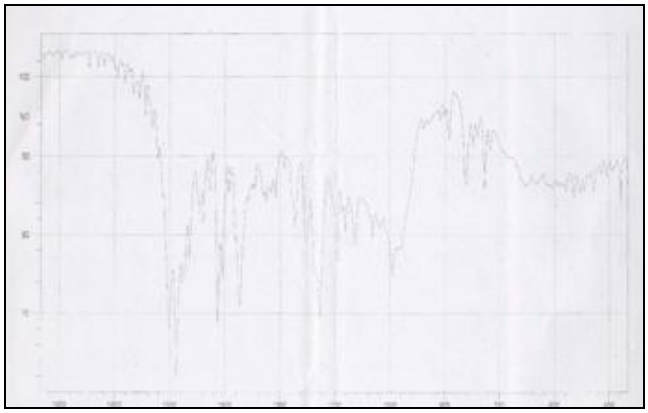


FIG. 1: GENISTEIN, METHOCEL K100 LV AND K4M

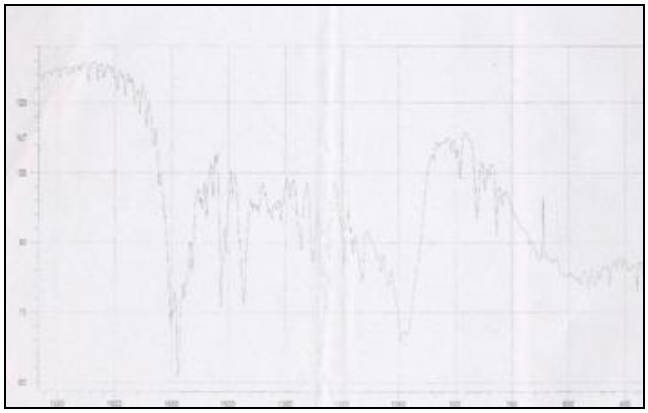


FIG. 2: GENISTEIN WITH MICROCRYSTALLINE CELLULOSE

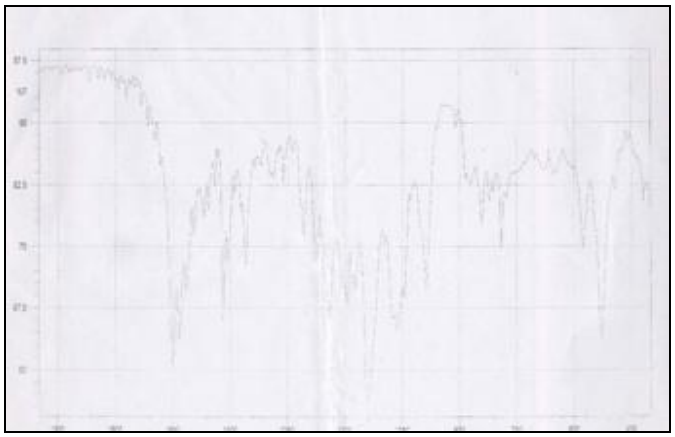


FIG. 3: GENISTEIN WITH DICALCIUM PHOSPHATE

Melting point apparatus was used to calculate the drug's melting point. The observed melting point is 150 °C. Drying-related losses: The loss on drying was less than 0.5 percent, as measured by drying 1.00 g at 100 °C to 105 °C for 2 h; it was found to be 3.08 percent w/w. Solubility is the ability to dissolve anything. The sample drug was mixed with 3 ml of different polar and non-polar solvents (Methanol, ethanol, acetone, water and glacial acetic acid) until it reached saturation **Table 5**. [14].

TABLE 5: SOLUBILITY IN DIFFERENT SOLVENTS

S. no.	Solvent	Solubility
1	Methanol	Freely soluble
2	Ethanol	Freely soluble
3	Acetone	Freely soluble
4	Water	Insoluble
5.=	Glacial acetic acid	poorly soluble

Standard Curve: HPLC was used to construct the standard curve for the drug. In different 10 ml volumetric flasks, aliquots of standard Genistein and Daidzein stock solution were taken and diluted up to the mark with the diluents, resulting in final concentrations in the range of 80 - 130 g/ml. Each of these drug solutions (20 L) was injected into the column and the peak area and concentration were measured.

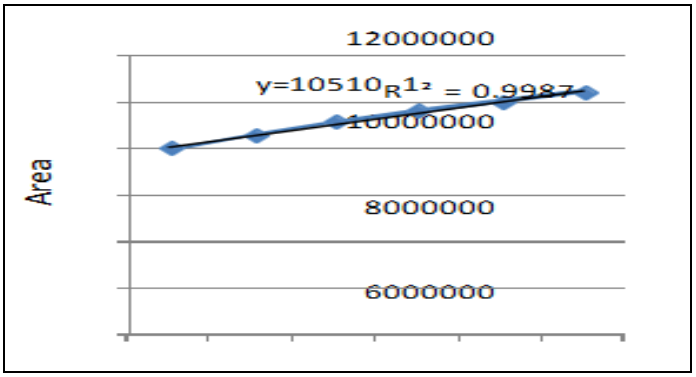
The peak area, as well as the retention time were measured. The test was carried out with a UV-detector set to 254 nm and a calibration graph was generated by plotting peak area versus concentration. In the range of 80 - 130 g/ml, the plot of each sample's peak area against its respective concentration was found to be linear. The correlation coefficients of standard Genistein and Daidzein were found to be 0.9938 and 0.9926, respectively, while those of the study were 0.9872 and 0.9864. The linear regression equation is as follows [15].

$$Y = mx + c$$

Where, Y = mean peak value, m = slope, c = intercept, × = mean concentration in ppm

TABLE 6: STANDARD CURVE FOR GENISTEIN

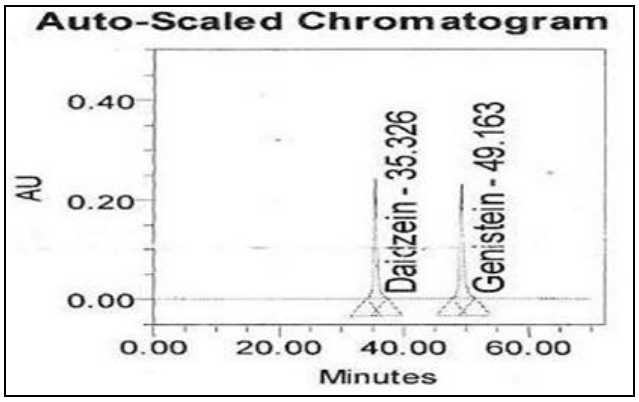
S. no.	Concentration (ppm)	Area
1	80	9043712
2	90	9134068
3	100	9247814
4	110	9358215
5	120	9457143

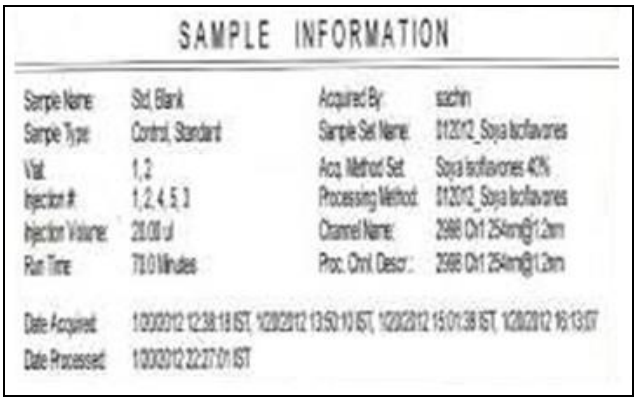


Fixationo Medication 100 Parts Per Million. The Genistein Standard Curve Was Discovered At A Depth of 10510.09 Meters. Genistein's Block Was 8197181.4 B and The Relationship Coefficient Was Discovered To Be 0.9987 Genistein.

Assay: Each film-coated sustained-release tablet contains 99.03 mg (99.03 percent) of Genistein per 100 mg of tablet.

Standard Chromatogram: Standard Chromatogram contains both Genistein which is a constituent of soy isoflavones.





S. no.	Sample name	Vial	Injection	RT	Area	System name
1	Standard	1	2	49.163	9247814	HPLC_18

Component of Genistein Sample Chromatogram: Color and Shape of Tablets in the Finished Product: Randomly selected tablets from each batch were found to be brown in color, round, and biconvex when examined under a microscope. Tablet Thickness and Diameter Test: Tablet thickness (n = 1000) is almost standardized for all formulations, ranging from 3.800.3 mm to 3.970.3 mm. Tablet mean diameter (n = 1000) was found to be consistent across all formulations, ranging from 10.6 mm 0.2 mm to 10.62 mm 0.2 mm. All of the tablets passed the hardness test with a hardness of 7.0-7.3 kg/cm^{-2}. The Monsanto hardness Tester was used to determine the mean hardness value (n = 1000) for all formulations. The results were shown in a table. The hardness of a tablet is not an absolute measure of its power. Friability is a tool that can be used to determine the strength of a tablet. The results of the friability test are mentioned in the table. Both of the formulations had a percent friability of less than 1%, meaning that the friability was within the prescribed limits. Friability tests revealed that the tablets were mechanically powerful. The obtained batch friability is 0.12%. Uniformity of drug content: The percentage drug content of both drugs in all manufactured tablets was found to be within acceptable limits [16]. Genistein have values ranging from 2.12 % - 1.96% to 2.65 % - 2.17% shown in **Table 6**.

TABLE 7: EVALUATION OF DIFFERENT FORMULATION

S. no.	Parameters	F1	F2	F3	F4	F5
1	Shape	Biconvex, Round	Biconvex, Round	Biconvex, Round	Biconvex, Round	Biconvex, Round
2	Thickness	3.9±0.3mm	3.72±0.3mm	3.9±0.3mm	3.43±0.3mm	3.9±0.3mm
3	Diameter	10.66±0.2mm	10.53±0.2mm	10.72±0.2mm	10.66±0.2mm	10.66±0.2mm
4	Hardness	7.3kg/cm2	7.0kg/cm2	7.3kg/cm2	7.3kg/cm2	7.3kg/cm2
5	Friability	0.18%	0.19%	0.23%	0.20%	0.12%
6	Average Weight	350mg±5%	366.2mg±5%	355.2mg±5%	350mg±5%	366.2mg±5%
7	Uniformity of content	2.65%-2.17%	2.12%-1.96%	2.45%-2.12%	2.12%-1.96%	2.45%-2.12%

***In-vitro* Dissolution Studies:** The *in-vitro* dissolution trials of a sustained release tablet of Soyaisoflavones as a dosage form were carried out using a dissolution test apparatus USP type Type II. For 12 h, the dissolution medium was 900 mL medium water + 1% SLS.

The medium temperature was held at 375 degrees Celsius. The paddle was rotated at a constant speed of 50 rpm. 5 mL aliquots were taken at fixed intervals and filtered *via* a membrane filter. The withdrawn samples are substituted with a fresh dissolution medium that has been equilibrated at the same temperature. UV-1800 series is used to calculate drug release at various time intervals from the dosage type [17].

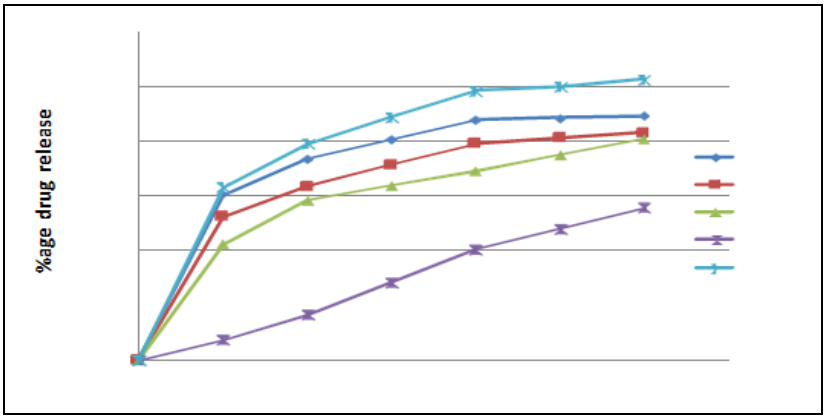
The Dissolution Profile of Percentage Drug Release: Combined Formulations Profile of Medium buffer pH 6.8+1% SLS is shown in **Table 7** and **Graph 1**.

TABLE 8: PERCENTAGE DRUG RELEASE OF DIFFERENT FORMULATIONS IN MEDIUM (BUFFER pH 6.8+1% SLS)

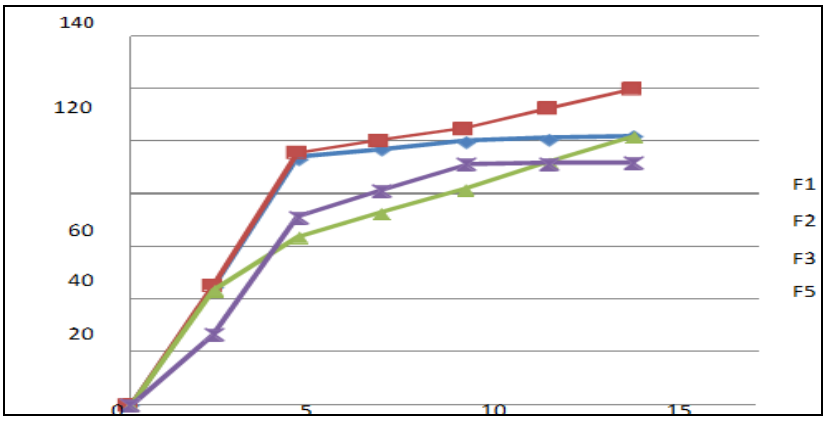
S. no.	Time(hrs)	F1	F2	F3	F4	F5
1	0	0	0	0	0	0
2	2	60.48%	52.48%	42.48%	7.65%	63.39%
3	4	73.65%	63.65%	58.65%	16.75%	79.24%
4	6	80.74%	71.44%	63.94%	28.68%	88.97%
5	8	87.83%	79.23%	69.23%	40.61%	98.69%
6	10	88.52%	81.22%	75.22%	48.23%	100.03%
7	12	89.20%	83 .20%	81 .20%	55.84%	102.77%

TABLE 9: PERCENTAGE DRUG RELEASE OF DIFFERENT FORMULATIONS IN MEDIUM (WATER +1% SLS)

S. no.	Time(hrs)	F1	F2	F3	F5
1	0	0	0	0	0
2	2	44.77%	45.26%	43.50%	26.90%
3	4	93.94%	95.94%	63.4%	71.49%
4	6	96.99%	100.49%	71.99%	81.45%
5	8	100.03%	105.03%	82.03%	91.40%
6	10	101.07%	112.57%	91.07%	91.73%
7	12	102.1%	120.1%	102.1%	92.65%



GRAPH 1: RELEASE PROFILE OF FORMULATIONS IN MEDIUM (BUFFER PH6.8 + 1% SLS)



GRAPH 2: RELEASE PROFILE OF FORMULATIONS IN MEDIUM (WATER +1% SLS)

According to dissolution tests, formulations F1, F2, F3 and F5 release 89.20%, 83.20% and 81.20% in medium buffer pH 6.8+1 % SLS, respectively, in 12 h and formulation F4 releases 55.84% in 1% SLS in phosphate buffer.

Stability Tests: For the F5 formulation, stability studies were performed for 3 months at 30 °C 2 °C and RH 65 percent 5 percent (real-time stability study) and at 40 °C 2 °C and RH 75 percent 5 percent (accelerated stability study). The results are listed in the table below. The physical appearance did not improve significantly, and a hardness test was performed at the end of the third month.

In-vitro dissolution profiles for formulation F5 stored at 30 °C, 2 °C and RH 65 percent 5 percent showed 92.57 percent release in the first month and 92.42 percent release at the end of the third month, while formulations stored at 40 °C, 2 °C and RH 75 percent 5 percent showed 91.71 percent release in the first month and 91.62 percent release at the end of the third month. As a result, there was no improvement in physical appearance, stiffness, drug content, or *in-vitro* dissolution profiles during the stability analysis. As a result, these formulations were found to be stable at the temperatures mentioned above [18].

Physical Appearance Test:

Formulation code	Tested after the time (in months)	Shape and Colour	Hardness (kg/cm^2)	Drug Content Uniformity
F5	3 months	Round, Biconvex and Brown color	7.0 ± 0.03	2.45%-2.12%

3 months Real Time Stability Studies (temp.30 °C ± 2 °C &RH 65% ± 5%) shows

Initial	1month	3 month
92.65%	92.57%	92.42%

Initial	1month	3 month
92.65%	91.71%	91.62%

3 months Accelerated Stability Studies (temp.40 °C ± 2 °C & RH 75% ± 5%) shows

Comparative Study with Marketed Product: A comparison is made between the F5 formulation and the marketed product's dissolution profile (Novasoy 40 percent Capsule). The Dissolution procedure is followed. The dissolution test apparatus USP Type II was used to conduct *in-vitro* dissolution studies of a sustained release tablet of Genistein as a dosage method. For 12 h, the dissolution medium was 900 mL medium water + 1% SLS. The medium was held at 375 degrees Fahrenheit. The paddle was rotated at a constant speed of 50 rpm. 5 mL aliquots were taken at fixed intervals and filtered via a membrane filter.

The withdrawn samples are substituted with a fresh dissolution medium that has been equilibrated at the same temperature. UV-1800 is used to calculate drug release at various time intervals from the dosage form. The drug release profile of F5 formulation and Novasoy Capsule in medium (water + 1% SLS)

TABLE 10: PERCENTAGE DRUG RELEASE OF FORMULATION (F5) AND NOVASOY CAPSULE (MARKET FORMULATION) IN MEDIUM (WATER + 1% SLS)

S. no.	Time (h)	Percentage drug release of Novasoy capsule	Percentage drug release of F5 batch
1	0	0	0
2	2	28.4%	26.90%
3	4	65.92%	71.49%
4	6	76.32%	81.45%
5	8	86.72%	91.40%
6	10	91.72%	91.73%
7	12	96.72%	92.65%

When the dissolution profiles of the Novasoy capsule and the F5 formulation were compared, the drug release of both formulations was found to be similar. In this study, Methocel Polymer of two grades, Methocel K100LV and Methocel K4M, was used to make Genistein tablets. Low viscosity retarding agent Methocel K100 LV was used, and high viscosity polymer Methocel K4M was used. Dibasic Calcium Phosphate was used as fillers, diluents and to preserve the pH of the formulation. Sodium Carbonate was used to maintain the pH of the formulation.

Isopropyl alcohol was used as a granulating agent, Magnesium Stearate was used as a diluent, Colloidal silicon dioxide was used as a glidant, and Polyvinylpyrrolidone was used as a binding agent. Shape, thickness, hardness, friability, diameter, uniformity of material, drug-polymer interaction tests, *in-vitro* dissolution studies, and stability studies were all performed on the prepared Genistein tablets. All of the measurements for shape, diameter, thickness, hardness, brittleness and uniformity of material are within limits. This is seen in the table above. According to the FTIR compatibility analysis, there was no contact between the drug and the polymer, as well as other excipients. Formulation F1, F2, F3, F4 batch dissolution in medium water + 1% SLS (*in-vitro*). The drug was not properly released in 12 h, but it was properly released in the F5 batch due to the correct polymer ratio (Methocel K100LV and Methocel K4M). The same formulations were tested in a medium buffer pH 6.8 + 1% SLS, but no proper drug release profile was obtained. The peak of Sample Soyaisoflavones component Genistein was found at 49.735 on HPLC, which was similar to the standard and the Linearity curve value was also similar to the standard. *i.e.*, under the limit, Correlation Coefficient(R) for Genistein = 0.9955. The value of Y is also comparable to that of the norm. The release of Genistein sustained-release tablets is 99.03 percent in a 100 mg tablet, according to the assay. The drug release profile of the final formulation and the branded product was found to be identical.

CONCLUSION: As a result of the findings, it was determined and concluded that Genistein sustained-release tablets are very beneficial and show long-term relief in diseases like menopause, breast cancer, bone health improvement and many more. The drug release reduces the peak and valley effect in plasma and provides patient comfort.

The results were good in which preformulation tests revealed that the drug has poor flow properties, and I.R findings revealed that the drug was compatible with the polymer and excipients. The drug was formulated with a variety of

excipients and the drug release profile was tested in medium water + 1 percent SLS and medium buffer pH 6.8+1 percent SLS. By comparing the results, it was determined that the proper drug release was achieved using Dissolution medium water + 1% SLS. When opposed to marketed formulations, Formulation F5 has a proper drug release profile and has a comparable drug release. The stability studies concluded that Genistein sustained release tablets were stable in both real-time and accelerated-time stability studies. Genistein was tested and found to be 99.03 percent in a 100 mg tablet which is sufficient for sustained release action.

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