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DEVELOPMENT AND EVALUATION OF ANTIDIABETIC SYRUP PREPARED FROM CONVOLVULUS PLURICAULIS FLOWER EXTRACT

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ABSTRACT :-

High blood glucose levels brought on by either insufficient insulin secretion or insulin resistance are the hallmark of diabetes mellitus, a chronic metabolic disease. Serious side effects from long-term diabetes include neuropathy, nephropathy, retinopathy, and cardiovascular disorders. Long-term usage of synthetic antidiabetic medications may have negative effects, which has sparked interest in safer herbal substitutes. The creation and assessment of an antidiabetic herbal syrup made from Convolvulus pluricaulis (Shankhpushpi), a medicinal plant with anti-inflammatory, antidiabetic, and antioxidant qualities, is the main objective of this work. In a Soxhlet system, the entire plant was pulverised, shade-dried, and extracted using ethanol. Alkaloids, flavonoids, tannins, glycosides, terpenoids, steroids, saponins, and sugars were identified during preliminary phytochemical screening.Diabetes mellitus is a chronic metabolic condition characterised by elevated blood glucose levels caused by either insufficient insulin production or insulin resistance. Neuropathy, nephropathy, retinopathy, and cardiovascular problems are among the most adverse effects of long-term diabetes. There is interest in safer herbal alternatives because long-term use of synthetic antidiabetic drugs may have unfavourable effects. The primary goal of this work is to create and evaluate an antidiabetic herbal syrup from Convolvulus pluricaulis (Shankhpushpi), a medicinal plant with anti-inflammatory, antidiabetic, and antioxidant properties. The entire plant was ground up, shade-dried, and then extracted using ethanol in a Soxhlet apparatus. Initial phytochemical screening revealed the presence of alkaloids, flavonoids, tannins, glycosides, terpenoids, steroids, saponins, and sugars.

Index terms:- Diabetes mellitus, Convolvulus pluricaulis, Herbal syrup, Antidiabetic activity, Phytochemical screening, Shankhpushpi.

I. INTRODUCTION :-

Persistent hyperglycemia brought on by deficiencies in insulin secretion, action, or both is a hallmark of diabetes mellitus, a chronic metabolic disease. Millions of people worldwide are impacted by what is regarded as one of the most serious global health issues. International health reports state that sedentary lifestyles, obesity, poor eating habits, stress, and genetic predisposition are all contributing factors to the fast rising prevalence of diabetes. Severe problems such cardiovascular illnesses, nephropathy, neuropathy, retinopathy, hypertension, and delayed wound healing can result from long-term uncontrolled diabetes. In order to lower morbidity and enhance quality of life, diabetes must be effectively managed.

Type 1, Type 2, and gestational diabetes are the three main forms of diabetes mellitus. While Type 2 diabetes is primarily linked to insulin resistance and decreased insulin secretion, Type 1 diabetes is caused by the autoimmune destruction of pancreatic β-cells, which results in insulin insufficiency. Approximately 90–95% of occurrences of diabetes globally are type 2, the most prevalent type. Insulin therapy, diet control, exercise, oral hypoglycemic medications, and lifestyle changes are typically used in the management of diabetes. Despite the effectiveness of synthetic antidiabetic medications, long-term usage may result in a number of side effects, such as hypoglycemia, gastrointestinal problems, weight gain, liver toxicity, and drug resistance.Due to their safety, affordability, improved patient compliance, and low side effects, medicinal plants and herbal formulations have drawn a lot of interest as alternative therapeutic agents in recent years. Many medicinal plants have been used in traditional medical systems like Ayurveda to treat diabetes and its consequences. Alkaloids, flavonoids, tannins, glycosides, phenolic compounds, terpenoids, and saponins are just a few of the many bioactive phytoconstituents found in herbal remedies that have antihyperglycemic, hypolipidemic, anti-inflammatory, and antioxidant properties.

Convolvulus pluricaulis Choisy, also called Shankhpushpi, is a member of the Convolvulaceae family of medicinal plants and is used extensively in ancient Ayurvedic medicine as a revitalising herb and brain tonic. The plant has considerable therapeutic value and is primarily found in arid, sandy areas of India. Convolvulus pluricaulis exhibits a variety of pharmacological effects due to the presence of alkaloids, flavonoids, coumarins, glycosides, sterols, tannins, carbohydrates, and phenolic chemicals, according to phytochemical examinations.Convolvulus pluricaulis has been shown in numerous experiments to have neuroprotective, antioxidant, anxiolytic, depressive, anticonvulsant, anti-inflammatory, hypolipidemic, and antidiabetic qualities. The plant's antioxidant action aids in lowering oxidative stress, which is crucial to the development of diabetes mellitus. Additionally, recent studies have demonstrated that the plant extract improves insulin sensitivity and increases glucose uptake via modifying metabolic pathways and glucose transporter proteins.

Because they offer a number of benefits, including as simplicity of administration, greater palatability, precise dosing, and increased patient compliance, particularly in paediatric and elderly patients, herbal syrups are among the most widely used oral liquid dosage forms. Additionally, syrup formulations make plant extracts more stable and palatable. Thus, the creation of a herbal antidiabetic syrup with Convolvulus pluricaulis extract may offer a patient-friendly, safe, and efficient substitute for the treatment of diabetes mellitus.

Therefore, the goal of this study was to create and assess a herbal antidiabetic syrup made from Convolvulus pluricaulis extract. Plant material extraction, phytochemical screening, formulation development, physicochemical assessment, and an examination of the resulting syrup formulation's in vitro antidiabetic activity are all included in the study.

II. Drug Profile of Convolvulus pluricaulis

Convolvulus pluricaulis Choisy, often referred to as Shankhpushpi, is a significant medicinal herb that is frequently used in Ayurvedic medicine. It is a member of the Convolvulaceae family. The plant, which is widely found in arid and sandy areas of India, has long been utilised as a nervine relaxant, brain tonic, memory booster, and rejuvenating herb. The presence of several bioactive phytoconstituents gives the plant considerable therapeutic significance.

Fig no 1 :- Convolvulus Pluricaulis flower

❖ **Taxonomical Classification**

Category		Description
• Scientific Name	:-	Convolvulus pluricaulis Choisy
• Family	:-	Convolvulaceae
• Common Name	:-	Shankhpushpi
• Kingdom	:-	Plantae
• Division	:-	Magnoliophyta
• Class	:-	Magnoliopsida
• Order	:-	Solanales

Morphological Characteristics

The perennial creeping herb Convolvulus pluricaulis has tiny funnel-shaped blooms and thin green stems. The leaves are coated in tiny hairs and range in form from linear to lanceolate. Flowers typically have a subtle scent and are pale blue or white in hue. The plant thrives on xerophytic, dry soils.

Phytochemical Constituents

Phytochemical investigations have revealed the presence of several important bioactive constituents in Convolvulus pluricaulis, including:

- Alkaloids
- Flavonoids
- Glycosides
- Tannins
- Phenolic compounds
- Steroids

- Terpenoids
- Saponins
- Carbohydrates

The plant's pharmacological and therapeutic properties are caused by these phytoconstituents.

Pharmacological Activities :-

Numerous pharmacological investigations have shown that Convolvulus pluricaulis has a variety of medicinal properties, including:

- Antidiabetic activity
- Antioxidant activity
- Neuroprotective activity
- Anti-inflammatory activity
- Hypolipidemic activity
- Anticonvulsant activity
- Anxiolytic activity
- Memory-enhancing activity

According to recent studies, the plant extract increases insulin sensitivity and improves glucose uptake via modifying metabolic pathways and glucose transporter proteins.

III. Aim and Objectives

Aim :-

To formulate and evaluate an herbal antidiabetic syrup containing Convolvulus pluricaulis extract.

Objective:-

- To collect and authenticate the plant material.
- To prepare plant extract using Soxhlet extraction method.
- To perform phytochemical screening of the extract.
- To formulate herbal antidiabetic syrup.
- To evaluate physicochemical properties of the syrup.
- To study in-vitro antidiabetic activity of the formulations

IV. Materials and Methods :-

Material :-

Plant material :-

A trained botanist verified the authenticity of the entire Convolvulus pluricaulis (Shankhpushpi) plant, which was gathered from a nearby medicinal plant source. To get rid of dirt and unwanted objects, the gathered plant material was thoroughly cleaned with distilled water. The cleaned plant material was ground into a powder using a mechanical grinder after being shade dried for seven to ten days at room temperature. For future research, the coarse powder was kept in sealed containers.

Table no :1 Chemicals and Reagents

Sr.No	Chemical /Reagent
1.	Ethanol
2.	Methanol
3.	Sodium benzoate
4.	Citric acid
5.	Dextrose
6.	Glycerin
7.	HCL
8.	Sodium hydroxide
9.	Ferric chloride
10	Sulfuric acid
11.	Acetic acid
12.	Chloroform
13.	Molisch reagent
14.	Dragendorffs reagent
15.	Mayers reagent
16.	Acetic anhydride
17.	Glacial acetic acid
18.	Caramel color

Instruments and Apparatus

: Instruments Used :-

1 .Electronic balance

2.UV-Visible spectrophotometer

3.Brookfield viscometer

4. pH meter

5. Soxhlet apparatus

6. Hot plate

7 .Magnetic stirrer

8. FT-IR instrument

Apparatus used :-

1.Beaker

2.Measuring Cylinder

3.Volumetric flask

4. Test tube

5. pipette

6.Round bottom flask

7. Glass funnel

8. Whatman filter paper

Methods -

1. **Collection and Authentication of Plant Material :-**

Dr. Yuvraj D. Kengar, Assistant Professor in the Department of Botany at Smt. Kusumtai Rajarambapu Patil Kanya Mahavidyalaya, Islampur, gathered and verified a fresh entire Convolvulus pluricaulis plant. To maintain the active phytoconstituents, the plant material was thoroughly washed and dried in the shade.

2. Drying and Powdering -

After cleaning, the plant material was shade-dried for seven to ten days until it was completely dry. Using a grinder, the dried material was chopped into tiny bits and ground into a powder. After passing the powder through sieve number 40 to achieve a consistent particle size, it was kept in sealed containers for upcoming experiments.

3.Preparation of Plant Extract by Soxhlet Extraction of Convolvulus pluricaulis Plant :-

Fig no 2:- Soxhlet extraction using menthol

Procedure :-

After being carefully cleaned, the entire Convolvulus pluricaulis plant was shade-dried for seven to ten days. To get a consistent particle size, the dried plant material was ground into a powder and sieved. A thimble containing around 220 g of powdered material was put inside the Soxhlet apparatus. The extraction was done continuously for six to eight hours using ethanol as the extraction solvent. After filtering and concentrating the resultant extract in a water bath at 40–50°C, the semisolid extract was kept in an airtight container for future research.

PHYTOCHEMICAL SCREENING:-

Table no :2 Phytochemical screening

Sr no	Test	Observation	Inference
1.	Test for Alkaloids a) Dragendorff's Test • Procedure: To 2 mL of extract, add a few drops of Dragendorff's reagent. b)Mayer's reagent • Procedure: To 2 mL of extract, add Mayer's reagent.	Orange-brown precipitate formed Cream-colored precipitate observed.	Alkaloids present Alkaloids present
2.	Test for Flavonoids a) Shinoda Test • Procedure: To the extract, add magnesium turnings followed by a few drops of concentrated HCl. b) Alkaline Reagent Test • Procedure: Add 2 mL of 2% NaOH solution to the extract.	Pink/red coloration developed. Intense yellow color formed, which became colorless upon addition of dilute acid.	Flavonoids present. Flavonoids present.
3.	Test for Phenolic Compounds and Tannins a)Ferric Chloride Test Procedure: Add a few drops of 5% $FeCl_3$ solution to 2 mL extract.	Blue-green coloration observed.	Phenolics and tannins present.
4.	Foam Test • Procedure: Shake 2 mL extract vigorously	Stable persistent froth	Saponins present.

	with distilled water for 10–15 minutes.	observed	
5.	Test for Glycosides Keller–Killiani Test • Procedure: Add glacial acetic acid containing trace $FeCl_3$ to the extract. Carefully add concentrated H_2SO_4 along the side of the test tube.	Brown ring formed at the interface.	Cardiac glycosides present.
6.	Test for Terpenoids Salkowski Test • Procedure: Mix extract with chloroform and carefully add concentrated H_2SO_4.	Reddish-brown coloration at interface observed	Terpenoids present.
7.	Test for Steroids Liebermann–Burchard Test • Procedure: Add acetic anhydride and concentrated H_2SO_4 to the extract.	Bluish-green coloration developed	Steroids present
8.	8. Test for Carbohydrates Molisch's Test •Procedure: Add Molisch reagent to extract and carefully add concentrated H_2SO_4 along the wall of the test tube.	Violet ring formed at the interface	Carbohydrates present.

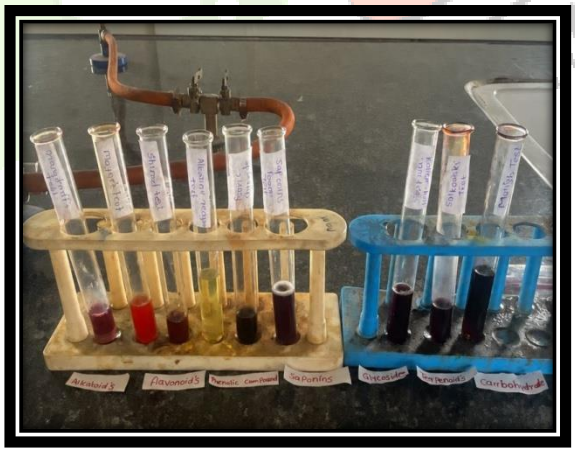


Fig:3 preliminary phytochemical screening test

The preliminary phytochemical screening of C. pluricaulis extract revealed the presence of several important bioactive constituents including alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, terpenoids, steroids, and carbohydrates. The positive results obtained in Dragendorff's and Mayer's tests confirmed the presence of alkaloids, which are known for their neuroprotective and therapeutic activities. Flavonoids detected by Shinoda and alkaline reagent tests indicate antioxidant potential, while phenolics and tannins contribute to antimicrobial and free radical scavenging activities. The foam test confirmed saponins, which possess expectorant and immune-enhancing properties. Positive Keller–Killiani, Salkowski, and Liebermann–Burchard tests suggested the presence of glycosides,

terpenoids, and steroids respectively, indicating possible medicinal and pharmacological significance. Molisch's test confirmed carbohydrates, which may contribute to nutritional and formulation properties. Overall, the phytochemical constituents present in Convolvulus pluricaulis support its traditional use as a medicinal herb and itssuitability for herbal syrup formulation.

3. UV Spectrometer:

The quantitative determination of chemical constituents in C.pluricaulis ethanolic extract was carried out using UV-Visible spectrophotometry.A calibration curve was constructed by measuring the absorbance of standard solutions at different concentrations.The concentrations used for the calibration were 2, 4, 6, 8, and 10 ug/mL.. Absorbance was recorded at Amax 270 mm, which is the maximum absorption wavelength for major phenolic and flavonoid compounds in the extract.The resulting calibration curve was used to quantify the concentration of chemical constituents in the plant extract based on the lineur relationship between concentration and absorbance.

Table 3: Absorbance of Extract at different concentration

Concentration (ug/ml)	Absorbance
2	0.256
4	0.567
6	0.856
8	1.125
10	1.385

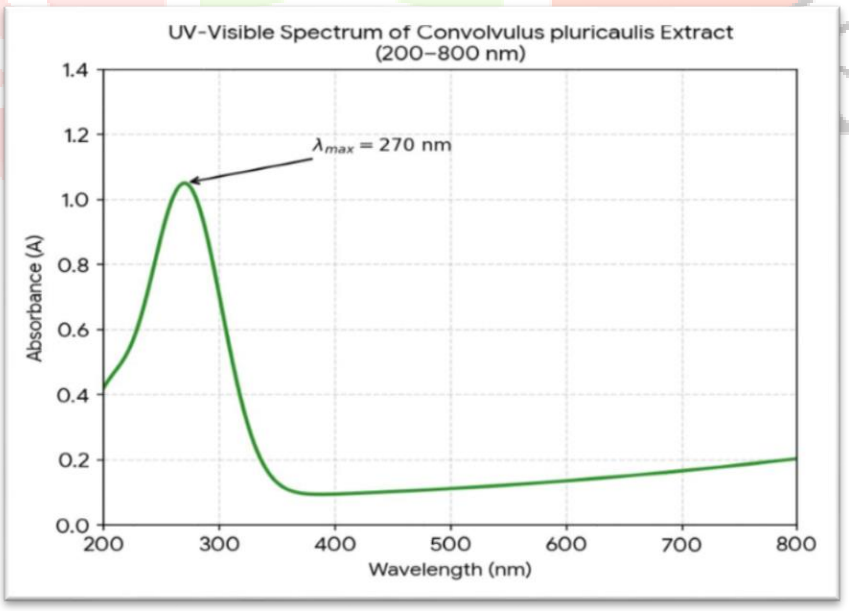


Fig 4 : UV-Visible spectrum curve

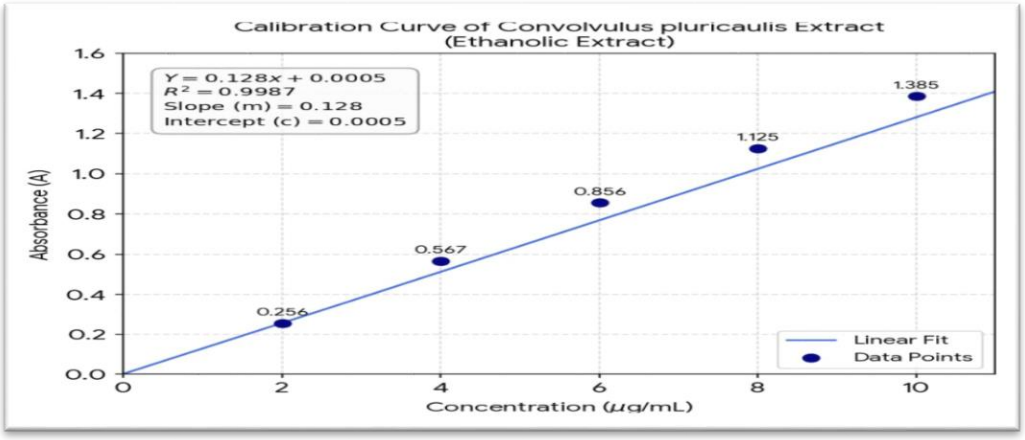


Fig 5: UV-Visible spectrophotometry calibration curve

Y=mX + C

Where ,

Y: Absorbance

M: Slope X- concentration (ug/ml).

C: intercept . data for calibration curve

The detail information of calibration curve are as follow: Y=0.128+0.0005

R2=0.9943

The value of slope (m) =0.128

The value of intercept (c)= 0.0005

The value of regression coefficient (R2)= 09987

4. FT-IR Analysis:

This FTIR spectrum of a liquid formulation of Convolvulus pluricaulis shows key functional groups [1]. The prominent, broad peak at 3347.74 cm-' indicates strong hydrogen-bonded O-H or N-H stretching, common in plant secondary metabolites like flavonoids or alkaloids. Sharp peaks near 2977 cm-' confirm aliphatic C-H stretches (sp' carbons). The strong band at 1645.34 cm ' signifies a C=0 carbonyl or C=C alkene stretch.

Additionally, intense peaks at 1083.78 cm-' and 1043.08 cm' correspond to C-O stretching [11. Together, these complex organic bands confirm a matrix rich in glycosides, phenolic compounds, and carbohydrates typical of herbal extracts.

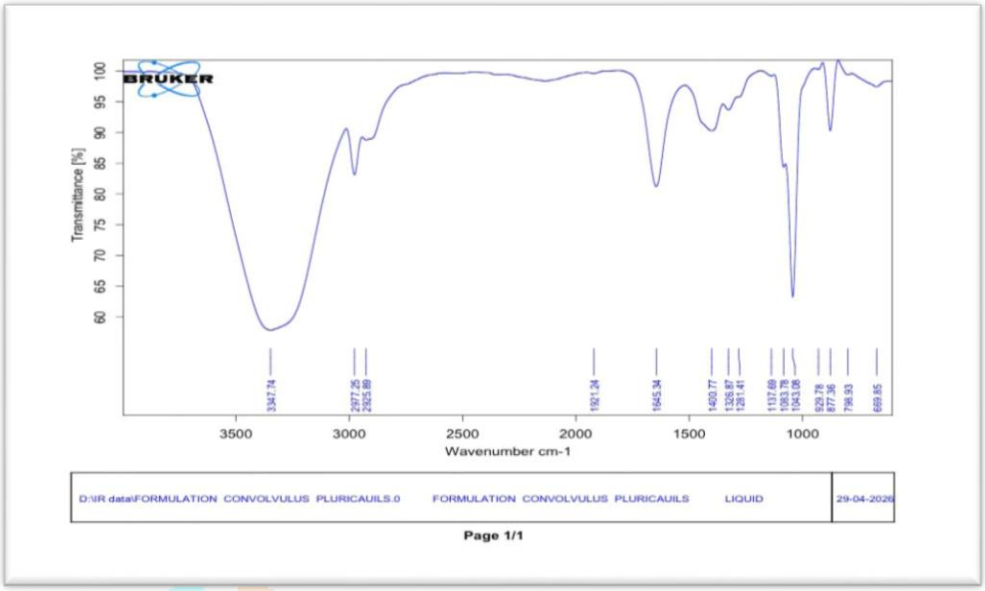


Fig 6: FT-IR Analysis

Srno.	Peak position	Bond /mode	Functional group
1.	3347.74	O-H	Alcohols/ phoenols
2.	2977.25	C-H	Alkanes
3.	2927.88	C-H symmetric stretching	Alkanes
4.	1921.24	Combination bond	Aromatic compound
5.	1645.34	C=C stretching C=C stretching	Alkanes /carbonly
6.	1400.77	O-H&C-H Bending	Alkanes
7.	1326.87	C-N stretching	Amines
8.	1261.47	C-Ostretching	Alcohol/ether
9.	1137.69	C-O-Cstretching	Ethers
10.	1083.78	C-Ostretching	Alcohol
11.	927.08	=C-H bending	Alkenes
12.	892.78	C-H out plane bending	Aromatic compound
13.	669.85	C-Br stretching	Halo copmund

Table 4:FT-IR Interpretation of Extract

V. Formulation Development :-

Fig no 7:- Antidiabetic syrup from convolvulus pluricaulis flower extract

Procedure :-

Coarse Powder of Convolvulus pluricaulis (20 g)

↓

Add Distilled Water (120 mL)

↓

Heating at 60–70°C for 30 min

↓

Filtration through Muslin Cloth

↓

Concentration on Water Bath

↓

Semisolid Herbal Extract Obtained

↓

Preparation of Syrup Base

(Dextrose 50 g + Purified Water 50 mL)

↓

Heating with Continuous Stirring

↓

Addition of Sodium Benzoate (0.1 g)

[Preservative]

↓

Addition of Citric Acid (0.2 g)

[Stabilizer]

↓

Addition of Herbal Extract (4 g)

↓

Addition of Glycerin (6 mL)

[Viscosity Enhancer]

↓

Addition of Flavour (0.2 mL)

+ Caramel Colour q.s

↓

Volume Adjustment with Purified Water

up to 100 mL

↓

Mixing using Magnetic Stirrer

↓

Filtration using Whatman Filter Paper

↓

Filling in Amber Coloured Bottle

↓

Labelling and Storage

↓

Prepared Herbal Antidiabetic Syrup

Formulation table :-

Formula:- Table no 6:- Formulation table

Ingredient	Quantity	Role
1. Convolvulus pluricaulis extract	4g	Antidiabetic active ingredient
2. Dextrose	50g	Sweetening agent and syrup base
3. Glycerin	6ml	Humectant and viscosity enhancer
4. Sodium benzoate	0.1g	Preservative
5. Citric acid	0.2g	Acidifying and stabilizing agent
6. Flavoring agent	0.2ml	Improves taste
7. Caramel color	q.s	Provides attractive color
8. Purified water	q.s to 100ml	vehicle

VI. EVALUATION TEST :-

1.Physical Evaluation Tests

1.1 Colour Test:

Procedure :-

A small quantity of syrup was taken in a clean test tube and observed visually under daylight against a white background.

Observation :- Brown coloured syrup was observed.

1.2 Odour :-

Procedure :-

The odour was checked by sensory evaluation.

Observation :- Characteristic herbal odour was observed

1.3 Taste :-

Procedure:-

A small quantity of syrup was tasted carefully.

Observation :- Sweet and pleasant taste was observed.

1.4 Clarity :-

Procedure :-

The syrup was visually inspected against light.

Observation :- Clear solution without visible particles was observed.

1.5 Viscosity :-

Procedure :-

The viscosity of syrup was measured using Brookfield viscometer at room temperature.

Observation :- Viscosity was found to be 145 cps.

1.6 Specific Gravity

Procedure :-

The cleaned and dried specific gravity bottle was filled with syrup and weighed.

Observation :-Specific gravity was found to be 1.20 g/mL.

2. Chemical Evaluation Tests :-

2.1 pH Determination :-

Procedure :-

The pH meter was calibrated using standard buffer solution and the pH of syrup was measured.

Observation

pH was found to be 5.6.

pH = 5.6

2.2 Drug Content Estimation

Procedure :-

1. Syrup sample was diluted appropriately.
2. Absorbance was measured using UV spectrophotometer at λmax.
3. Drug concentration was calculated using calibration curve.

Observation :-

4. Drug content was found to be 97.4%

❖ **In- Vitro Antidiabetic Activity test:**

A) α-Amylase Inhibition Assay:

Procedure:

1.Prepare enzyme (α-glucosidase), substrate (pNPG), buffer, and test sample.

2.Mix enzyme with buffer and test sample.

3.Pre-incubate at 37°C for 10–15 min.

4.Add substrate (pNPG) to start reaction.

5.Incubate at 37°C for ~20 min.

6.Measure absorbance at 405 nm and calculate % inhibition

B) Alpha -Amylase Inhibition Assay:

1. Prepare enzyme (α-amylase), starch solution, buffer, and test sample.

2 .Mix enzyme with test sample and incubate at 37°C for 10 min.

3.Add starch solution to initiate reaction.

4.Incubate at 37°C for ~15–20 min.

5.Add DNSA reagent and heat to stop reaction.

6.Measure absorbance at 540 nm and calculate % inhibition

C) Glucose Uptake Assay:

1.Prepare sample formulations/extracts at different concentrations (e.g., 20, 40, 60, 80, 100 µg/mL).

2.Culture suitable cells (such as yeast cells or muscle/adipocyte cells) under standard laboratory conditions.

3.Incubate cells with glucose solution and test samples for a fixed time period.

4.Include a standard drug (such as metformin) and control group for comparison.

5.Measure remaining glucose in the medium using a glucose estimation method (DNSA/Glucose kit).

6.Calculate % glucose uptake and compare activity of formulations with standard .

VII. Result :-

Table 7 :-Test for syrup :-

Sr no.	Evaluation Parameter	Instrument used	Result	Standard requirement
1.	Color	Visual observation	Brown	Acceptable
2.	Oder	Sensory evaluation	Characteristic oder	Acceptable
3.	Taste	Sensory evaluation	Sweet and pleasant	Acceptable
4.	pH	pH meter	5.6 to 0.2	4-7
5.	Viscosity	Brookfield viscosity	145cps	Smooth flow
6.	Specific gravity	Specific gravity bottle	1.20g/ml	1-1.5g/ml
7.	Drug content	UV spectrophotometer	97.4%	90-100%
8.	Clarity	Visual inspection	Clear solution	Free from particles
9.	Antidiabetic activity	Blood glucose reduction study	Significant reduction observed	Effective activity

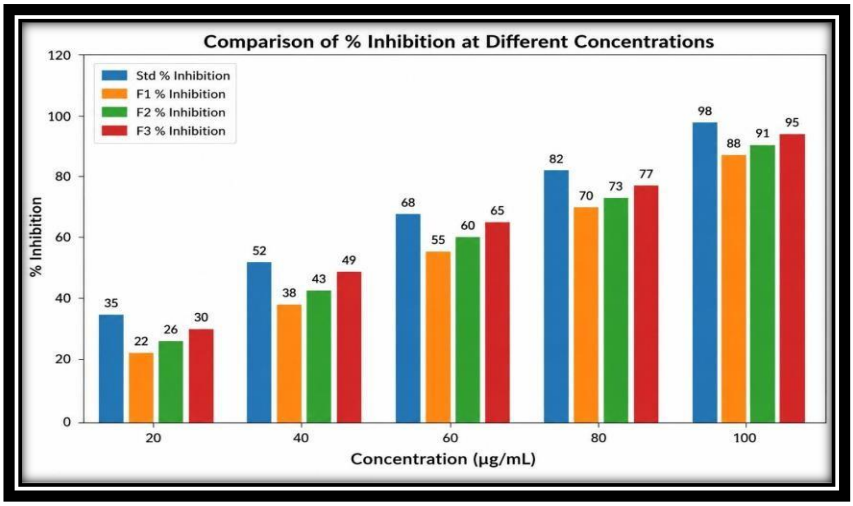
❖ **In- Vitro Antidiabetic Activity test:**

A) α-Amylase Inhibition Assay:

Observation table 8: -

Conc. (µg/mL)	Std % Inhibition	F1 % Inhibition	F2 % Inhibition	F3 % Inhibiti
20	35	22	26	30
40	52	38	43	49
60	68	55	60	65
80	82	70	73	77
100	98	88	91	95
IC_{50} (µg/mL)	**42**	**65**	**58**	**52**

Graphical Representation: -

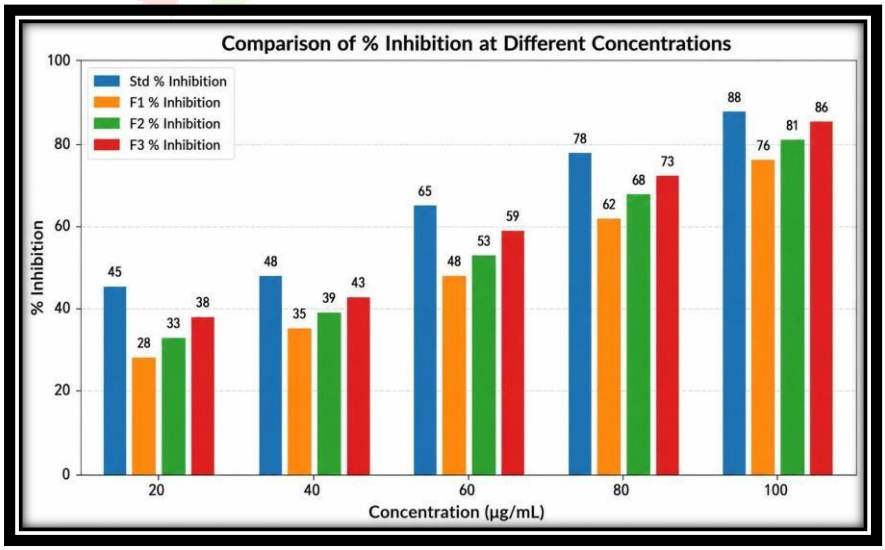


B) Alpha -Amylase Inhibition Assay:

Observation table 9 :

Conc. (µg/mL)	Std % Inhibition	F1 % Inhibition	F2 % Inhibition	F3 % Inhibition
20	28	12	15	18
40	46	24	28	32
60	64	39	44	49
80	81	55	61	68
100	92	70	76	82
IC_{50} (µg/mL)	54	74	68	61

Graphical Representation

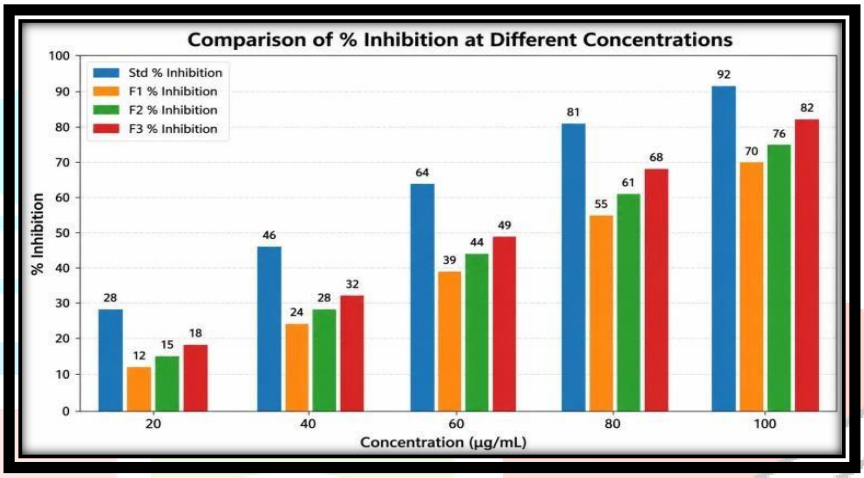


C) Glucose Uptake Assay:

Observation table 8 :

Conc. (µg/mL)	Std % Inhibition	F1 % Inhibition	F2 % Inhibition	F3 % Inhibition
20	28	12	15	18
40	46	24	28	32
60	64	39	44	49
80	81	55	61	68
100	92	70	76	82
IC_{50} (µg/mL)	54	74	68	61

Graphical Representation



In all three in vitro tests—AlphaGlucosidase inhibition, Alpha-Amylase inhibition, and the Glucose Uptake assay—the formulations demonstrated strong antidiabetic effectiveness. F3 demonstrated the most inhibitory and glucose uptake efficacy of all the formulations, yielding outcomes that were most similar to those of the conventional medication. F1 was much less effective, whilst F2 showed moderate activity. The compositions appear to have promising antidiabetic potential overall, according to the study.

VIII. Conclusion :-

The current study successfully concentrated on the development and assessment of an antidiabetic herbal syrup made from C. pluricaulis flower extract. The project emphasised the significance of herbal medicines as safer and more affordable alternatives for the management of diabetes mellitus. The authenticity and medicinal value of the plant material were confirmed by detailed pharmacognostic and phytochemical investigations; macroscopical evaluation revealed distinctive features such as slender creeping stems, lanceolate leaves, and funnel-shaped flowers, supporting correct identification and purity of the crude drug.

Alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, terpenoids, steroids, and carbohydrates were among the bioactive components found in preliminary phytochemical screening. The therapeutic potential of the formulation is greatly enhanced by the recognised antioxidant, antibacterial, and antidiabetic qualities of these phytochemicals. These components support the traditional therapeutic use of C. pluricaulis in herbal medicine.

In terms of appearance, stability, and drug content, the produced syrup formulation demonstrated acceptable physicochemical properties. 97.4% drug presence was found via drug content estimate, demonstrating formulation precision and consistency. Good formulation compatibility and shelf stability

were confirmed by stability studies, which showed that the syrup remained stable throughout storage without precipitation, colour change, or phase separation.
Promising dose-dependent suppression in α-amylase, α-glucosidase, and glucose absorption assays was observed in the in-vitro antidiabetic efficacy studies. The extract showed strong inhibitory efficacy that was on par with conventional medications, indicating that it could lessen the breakdown of carbohydrates and enhance the use of glucose. These results suggest that the prepared syrup has a great deal of promise as a natural antidiabetic treatment for efficient blood glucose management.
The study's overall findings indicate that the herbal syrup made from C. pluricaulis flower extract has strong phytochemical and antidiabetic qualities along with favourable formulation and stability. The mixture may be regarded as a viable herbal substitute for the treatment of diabetes. However, more research is advised to determine its safety, effectiveness, and therapeutic applicability on a broader scale, including advanced pharmacological evaluation, toxicity studies, and clinical trials.
In all three in vitro tests—AlphaGlucosidase inhibition, Alpha-Amylase inhibition, and the Glucose Uptake assay—the formulations demonstrated strong antidiabetic effectiveness. F3 demonstrated the most inhibitory and glucose uptake efficacy of all the formulations, yielding outcomes that were most similar to those of the conventional medication. F1 was much less effective, whilst F2 showed moderate activity. The compositions appear to have promising antidiabetic potential overall, according to the study.

IX. Reference :-

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