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Formulation And Assessment Of Spine Gourd Herbal Tea Bag For The Management And Prevention Of Diabetes Mellitus

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ABSTRACT

Diabetes mellitus is a long-term metabolic disease marked by high blood sugar levels brought on by deficiencies in either the action or secretion of insulin, or both. The need for efficient complementary therapy with few adverse effects is growing as the condition's prevalence rises worldwide. Phytochemical-rich herbal remedies have encouraging antidiabetic potential. Using a combination of traditional antidiabetic herbs, Momordica dioica (spine gourd), Cinnamomum zeylanicum (cinnamon), Zingiber officinale (ginger), Ocimum basilicum (basil), and Citrus limon (lemon peel), this effort concentrated on creating and testing herbal tea bags.

Several formulation and evaluation tests, such as physicochemical parameters, moisture content (6%), pH (6.86), antimicrobial tests, and organoleptic assessment (colour, aroma, mouthfeel) were performed on the tea bags. According to the performed study, every parameter was within specification, and the tea bags showed good stability and infusion efficiency over time. The presence of flavonoids, saponins, alkaloids, and tannins compounds with antidiabetic qualities was verified by preliminary phytochemical screening. The herbal tea formulation was determined to be physicochemically stable, organoleptically acceptable, and to have potential antidiabetic action after taking into account all evaluations. These findings indicate that the herbal tea formulation could be used as an adjuvant phytopharmaceutical in the treatment of diabetes mellitus.

Keywords: Momordica dioica, Diabetes mellitus, Tea bag, Supportive medication.

INTRODUCTION

Around the world, herbal teas are commonly used as nourishment as well as a remedy for a variety of illnesses·[1] Herbal teas are often prepared right before use and come in bulk or sachet form.[2] They contain one or more herbs that are specifically used for oral aqueous preparations through maceration, decoction, or infusion. Their color, clarity, and scent vary according on the constituents that make them up.[3] The leaves, seeds, bark, flowers, or any other part of the plant can be used to make herbal teas, depending on how the compounds dissolve in water.[4]

The herbal tea industry has grown as a result of growing awareness of the benefits of drinking herbal teas, which has ultimately contributed to the development of new disease treatments and job possibilities.[5] Due to their ability to promote relaxation, herbal teas are frequently drunk for their medicinal and revitalizing qualities. Herbal teas have the potential to assist resolve digestive or stomach issues while also strengthening the body's immune system and offering cleansing benefits. Because different plants may have varied therapeutic qualities, it's vital to keep in mind that we can create our own herbal infusions based on how we want the tea to help us.[6]

Diabetes, often known as diabetes mellitus, is a new global health emergency that has far-reaching effects on people and healthcare systems.[7] An estimated 537 million people between the ages of 19 and 80 have diabetes, making it one of the most common diseases in the world. If the current trend continues, this number is predicted to increase to 643 million by 2030 and 783 million by 2045. Furthermore, diabetes is estimated to have contributed to 6.7 million deaths worldwide and cost the global health system over 966 billion dollars in 2021 alone.[8] Diabetes mellitus, which is most usually classified as type 1 or type 2, is treated according to its etiopathology.[9] The frequency of type 2 diabetes mellitus (DM), a chronic metabolic disease, has been gradually rising worldwide. Due to this trend, it is quickly turning into an epidemic in some countries, and the number of affected individuals is predicted to double in the next ten years as a result of the aging population. This will increase the already heavy burden on healthcare providers, particularly in less developed nations.[10]

The seriousness of diabetes is demonstrated by additional statistical study, which reports that half a billion individuals worldwide have the condition and that number will increase to 25%. Invasive, economical, and proactive medical practices are needed to detect diabetes risk early. [11] Due to the rising expense of conventional antidiabetic drugs and their inability to address the underlying problem of diabetics' losing beta cells, individuals are turning to herbal medicines, particularly in low- and middle-income nations like Ghana.[12] In Ghana, the use of alternative medicines to treat diabetes and other conditions has increased as a result of phytomedicine's incorporation into the country's main healthcare delivery system.[13] Many people still suffer from diabetes even if there are numerous drugs available for the ailment because of the possible negative effects of the existing therapies. Herbal remedies with possible antidiabetic effects have long been used by traditional healers.[14] Since they offer advantageous therapeutic elements for a variety of ailments, natural herbal treatments have been utilized in human medicine for thousands of years. Experts in the sector are able to securely, effectively, and satisfactorily analyze crude drugs so that they can be integrated into contemporary healthcare facilities. [15]

Momordica dioica

Momordica dioica Roxb. ex Willd. (M. dioica Roxb.) is a crop in the Cucurbitaceae family that is rich in nutritional and medicinal properties. Fruits are used in Ayurvedic medicine and other traditional medicine to treat a number of metabolic diseases, such as diabetes, obesity, hyperglycemia, and hyperlipidemia. Additionally, it has been used historically to treat fever, inflammation, ulcers, skin conditions, hemorrhoids, and hypertension. It is also used as a diuretic, analgesic, hepatoprotective, and cardioprotective.[16] People from all continents have a long history of using medicinal plants as a source of treatments to treat a variety of illnesses, dating back to prehistoric times.[17] Momordica dioica contains trace amounts of alkaloids,

steroids, triterpenoids, flavonoids, glycosides, tannin and saponins.[18] Tribal people mostly use the spine gourd (Momordica dioica Roxb.), an underutilised vegetable with enormous nutritional and therapeutic potential. It is extensively dispersed over southern India and the Andaman Islands, as well as Assam, the Garo Hills of Meghalaya, West Bengal, Uttar Pradesh, Bihar, Maharashtra, Madhya Pradesh, and Gujarat. Every portion of the plant has therapeutic uses. Momordica dioica Roxb. fruit possesses antidiabetic activity by increasing serum insulin, HDL and decreases fasting blood glucose, glucose, total cholesterol, very low density lipoprotein and low density lipoprotein. Phenolic compounds and flavonoids are responsible for reducing diabetes.[19]

Fig No. 1: ***Momordica dioica***

Cinnamon

For thousands of years, people have utilized cinnamon, one of the oldest spices known to science, in both traditional herbal medicine and cookery. Cinnamon was really among the first spices to arrive in the Mediterranean. [20] Originally from Southern India and Sri Lanka, the cinnamon tree usually reaches a height of 7 to 10 meters. The thin lateral shoots of various tropical evergreen trees in the genus Cinnamomum are harvested for their bark, which is known as cinnamon.[21] Harvesting trees usually occurs every two to three years. To give the resulting quills their unique shape, the outer bark is first scraped off and then the inner bark is sliced into strips that curl when they dry. The Arabic and Hebraic word amomon, which means fragrant spice plant, is where the botanical name Cinnamomum originates. The Old Testament and Sanskrit texts both include frequent references to cinnamon. Due to the spice's antibacterial qualities, cinnamon was employed in ancient Egypt as a flavoring and medicinal ingredient as well as in embalming. Cinnamon and its extract have long been linked to a number of health advantages, regardless of the species. For instance, cinnamon bark is said to be used in traditional medicine to cure a variety of ailments, such as respiratory tract infections, diabetes, and digestive issues, antioxidant, antitumor, cardiovascular, cholesterol-lowering, and immunomodulatory effects.[22] Consuming cinnamon in the diet may also help regulate blood sugar and cholesterol.

Fig No. 2: Cinnamon

Ginger

Since ancient times, people in China and Southeast Asia have utilized ginger (Zingiber officinale) rhizomes as nutritional supplements. In China, ginger was initially recorded as a herbal remedy circa 3000 BC. It was mostly suggested as a treatment for tetanus, leprosy, fever, and cold. Ginger is also used medicinally as a digestive aid and to relieve nausea and upset stomach. [23] Ginger root is a safe herbal supplement that can be used in complementary and alternative medicine preparations, according to the U.S. Food and Drug Administration (FDA).[24] The European Medicines Agency recognized ginger rhizome as an authorized therapy modality in 2012 for the prevention of motion sickness-related nausea and vomiting due to its demonstrated positive benefits. [7] Numerous research conducted in recent years have shown that ginger has a wide range of biological properties, including anti-inflammatory, antioxidant, anti-microbial, anti-cancer, and neuroprotective benefits. It has also been discovered that the bioactive substances found in ginger's rhizome are responsible for its pharmacological advantages.[25]

Fig No. 3: Ginger

Basil

Ocimum basilicum L., or sweet basil, is a member of the Lamiaceae family and has been employed for centuries in ritual, medicinal, and more recently the culinary arts. According to Harold McGee (1984/2004, p. 402), the tropical genus Ocimum2 was likely domesticated in India after having its origins in Africa.[26] Numerous varieties and cultivars of basil have been cultivated for millennia as culinary herbs, medicinal plants, and insect repellents. With good reason, basil is well-known for its medicinal and preservation properties. For example, basil has long been used medicinally to relieve stress, anxiety, and brain fog. Basil is frequently called the "king of herbs," a reference to the Greek word basileus, which means "king."[27] The fresh herb of basil may contain menthol, eugenol, estragole, and anethole, among other chemicals with anise flavors. [28] Basil has long been used as a medicinal plant to cure a variety of ailments, such as renal dysfunction, warts, worms, migraines, coughing, diarrhoea, constipation, and painful postpartum uterine contractions. In addition to its antibacterial qualities, basil has a preservation effect. 10. Like many other culinary herbs, basil has antifungal properties and contains antioxidants and other chemicals that work as powerful insecticidal agents.

Fig No. 4: Basil

Lemon Peel

The majority of the polyphenolic chemicals found in citrus peel are transformed into juice. The juice industry produces a lot of citrus peel as a by-product because the juice yield is only around half of the fruit weight. Out of the 150,000 tons of citrus peels produced annually in the preparation of citrus juice, Korea produces roughly 40,000 tons of by-products. The food sector may be interested in isolating useful chemicals from citrus peels since they help slow down oxidative deterioration of food, enhancing its nutritional content and quality. Fernandez-Lopez et al. (2004) found that citrus by-products' antioxidants and functional dietary fibre enable their use in food processing to create nutritious goods employing cooked and dry-cured sausage. Applications may be limited by the peel extract's dark hue, which could detract from the food component's look. Our investigation into the impact of gamma irradiation treatment on citrus peel extract revealed that the treatment enhanced colour qualities without negatively impacting physiological functions.[29]

Fig No. 5: Lemon Peel

RESEARCH METHODOLOGY:

1. Materials

Materials used in the research include for beverage preparation. The ingredients used for making the drink are water, Momordica Dioica Roxb fruits powder, Lemon peels, Ginger, Basil leaves and Cinnamon.

2. Methods

The process of making herbal tea from Momordica Dioica Roxb is done by drying the ingredients at a temperature of 50°C to a constant weight. The dried material was then crushed and sieved using an 10mesh sieve. Momordica Dioica Roxb fruits powder, Lemon peels, Ginger, Basil leaves and Cinnamon that have been shifted are then mixed using a predetermined method, the preliminary phytochemical analysis of lemon grass tea was carried out as per the methods given here under.

3. Sample collection, Identification and Authentication

The collection of ingredients from Lehegaon town, identified and authenticated from P. R. Pote Patil College of Agriculture, Amravati (Maharashtra, India). The sample was collected by hand picking. The collected samples were washed with fresh water to separate contaminates such as adhering impurities, sand particles and dust. Then prepare the ingredient and separated. The ingredient was stored at room temperature until further analysis.

Fig No. 6: Ingredients of Tea Bag

4. Formation of Momordica Dioica Roxb tea

Wash the Momordica Dioica Roxb fruits, Basil leaves, Cinnamon and cut them into small pieces. Allow the Momordica Dioica Roxb fruits, Basil leaves and Cinnamon to dry, then grind the dried Lemon peels, Ginger. Take 8 grams of Momordica Dioica Roxb fruits powder, 5 grams of Basil leaf powder, 4 grams of dried ginger powder, 4 grams Lemon peels powder and 2 grams Cinnamon powder. The powder was mixed well and packed into the bags. Each bag is filled with 2.3 grams of powder, and the tea bag is dipped in 100 ml of hot water (Table 1,2; Fig. 1,2).

Sr. No.	Ingredients	Quantity per Tea bag (gm)	Quantity per Tea bag(%W\W)
	Momordica Dioica Roxb. Fruit powder	0.8 grams	34.78%
	Basil leaves powder	0.5 grams	21.73%
	Lemon peel powder	0.4 grams	17.39%
	Ginger powder	0.4 grams	17.39%
	Cinnamon powder	0.2 grams	8.69%
	Total	2.3 grams	100%

Table No.01: Amount of the ingredients

Fig No. 7: Formulation of Tea bag

5. Preliminary phytochemical screening:

Sr. No.	Tests	Procedure	Observation	Interference
1.	Alkaloids	Approximately 0.5 grams of sample was placed in a test tube and diluted and homogenized with 10 milliliters of distilled water. It was then dissolved in 20 milliliters of dilute HCl solution and clarified through filtration. The resulting filtrate	The solution that was treated was monitored for the emergence of a white or creamy precipitate (Mayer's reagent) and the development of an orange-yellow or brown precipitate (Dragendorff's).	Presence of Alkaloids

		was tested using Drangendroff's and Mayer's reagents.		
2.	Phenols	Approximately 0.5 grams of sample was placed in a test tube and blended with 100 ml of distilled water before being gently heated. Following this, 2 ml of ferric chloride solution was incorporated into the mixture.	Formation of green or blue colour.	Presence of Phenols
3.	Tannins	Ferric Chloride Test: A few drops of ferric chloride were added to 2 ml of the sample.	Blue-black or brownish green precipitate	Presence of tannins.
4.	Flavonoids	About 5 ml of dilute ammonia solution was added to a portion of the aqueous filtrate sample followed by addition of concentrated H2SO4	A yellow coloration	Presence of flavonoids
5.	Saponins	The Froths test involves diluting 1 milligram with distilled water and shaking for 15 minutes.	Presence of foam	Presence of saponin
6.	Triterpenoids	Burchard Liebermann Reaction: 1 ml of chloroform is used to dissolve 5 mg of the sample, and 1 ml of acetic anhydride is added after 1 ml of concentrated H2SO4	Formation of reddish brown or reddish violet colour	Indicates the presence of triterpenoid

Table no. 02: Preliminary phytochemical screening

1. **Preliminary Phytochemical Screening Using UV Spectroscopy:**

Preliminary phytochemical screening is a method used to identify bioactive compounds in plant materials. It involves preparing a powdered sample with a solvent, filtering, and analyzing it using UV-Visible spectrophotometry. The absorbance spectrum indicates the presence of specific phytochemical classes, which can be validated through qualitative and quantitative analyses**.**

Phytochemical Class	**Typical λmax (nm)**
Flavonoids	250–280 & 300–380
Alkaloids	200–300
Tannins	270–290
Saponins	UV inactive (indirect tests used)
Terpenoids	210–280
Phenols & Polyphenols	270–290
Coumarins	270–360

Phytochemical Class	Typical λmax (nm)
Essential oils	UV active if unsaturated

7. Evaluation of Momordica Dioica Roxb Tea Bag Formation

a) Sensory Assessment

Color – Visual characteristics of the dry powder and the prepared tea.

Aroma – Distinctive herbal fragrance.

Flavor – Presence of bitterness, astringency, or other pertinent flavors.

Mouthfeel – Granularity or smoothness of the powder.

b) Brew Performance / Infusion Analysis

Clarity: Assess the infusion for any presence of sediment or cloudiness.

Color: Analyze the intensity of the tea's color.

Duration for Full Infusion: Typically achieved within 3 to 7 minutes in hot water.

Final Volume Post-Brewing: Measure the final volume after 5 minutes of steeping in 100 ml of boiling water.

c) pH Evaluation

The pH assessment of Momordica dioica Roxb. tea bag formulation ensured its stability and taste, ensuring it falls within the acceptable pH range of 5.5-7.5 for consumer safety and product quality.

d) Moisture content

The moisture content of a tea bag, including Momordica dioica Roxb., is assessed using a gravimetric technique. The bag is weighed, dried, and then cooled to determine its dry weight. The moisture content is calculated using a formula:

Moisture Content (%) = (Wet Weight - Dry Weight) / Wet Weight × 100

This method ensures the tea bag's stability, shelf life, and quality, as excessive moisture can promote microbial growth or degradation of herbal ingredients.

e) Microbial loading

To assess microbial contamination in a tea bag formulation like Momordica dioica Roxb., sterilize equipment and apply the sample to a sterile nutrient agar plate. Incubate the plate at 37°C for 24 to 48 hours for bacterial growth and 25°C for 3 to 5 days for fungal growth. Examine colonies for bacterial or fungal contamination.

f) Evaluation of Antidiabetic Potential Using *Aspergillus niger* as a Model Organism:

The study aimed to evaluate the antidiabetic potential of tea bags using an in vitro model using the fungal strain Aspergillus niger. The tea infusion was prepared by submerging a tea bag in distilled water and then filtered. The fungus was cultured on Potato Dextrose Agar (PDA) and incubated for three to five days. The disc diffusion assay was used to assess enzyme inhibition. The inoculated PDA plates were covered with filter paper discs impregnated with the tea infusion, and any visible zones of inhibition were measured. The results indicated potential suppression of α-glucosidase activity and fungal development.

g) Uniformity of mass of tea bag:

The flowability of tea bag formulation is crucial in manufacturing, ensuring consistent quality, precise dosing, and even filling during automated or semi-automated production.
The following standard characteristics are frequently evaluated to find out how well the powdered or granulated herbal blend used in tea bags flows:

1.Angle of Repose

The maximum angle between a powder pile's surface and horizontal plane is measured using a funnel to estimate flowability.

2. Bulk Density and Tapped Density

These are established in order to compute the Hausner ratio and compressibility index:

The mass of the powder divided by the bulk volume is the bulk density (ρb).

Mass of powder divided by tapped volume (after mechanical tapping) is the Tapped Density (ρt).

3.Carr's Compressibility Index (%)

Compressibility Index= $\rho t - \rho b / \rho t \times 100$

4. Hausner Ratio

Hausner Ratio=$\rho b / \rho t$

Good flowability in tea bag formulations ensures even filling, seamless processing, and improved control, preventing inconsistent bag weights, equipment clogs, and decreased product quality.

RESULT AND DISCUSSION:

1. **Phytochemical screening Momordica Dioica Roxb. Formulation:**

The positive phytochemical evaluation results suggest that the studied plant material contains a variety of bioactive chemicals. These include alkaloids, flavonoids, tannins, saponins, terpenoids, phenols, and glycosides, all of which have a variety of medicinal characteristics.

Sr. No.	Tests	Result
	Alkaloids	Present
	Phenols	Present
	Tannins	Present
	Flavonoids	Present
	Saponins	Present
	Triterpenoids	Present

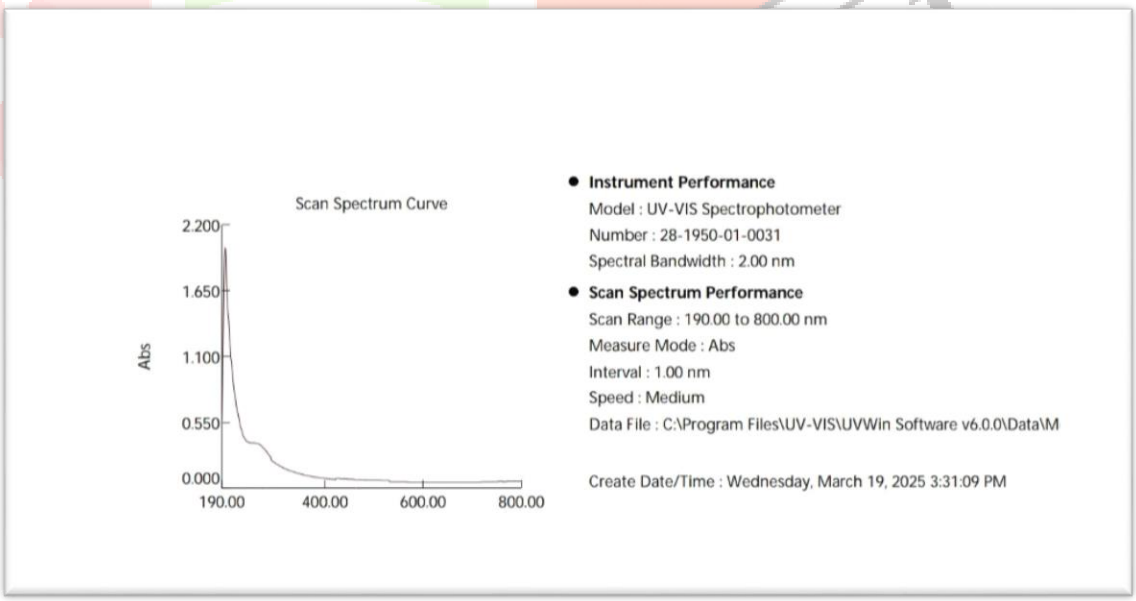
Table no. 03: Phytochemical screening Momordica Dioica Roxb. Formulation

Fig. No. 6: Preliminary Phytochemical Screening Tests for Various Phytoconstituents

2. **Phytochemical Screening Using UV Spectroscopy:**

The phytochemical analysis of the sample using UV-Visible spectroscopy produced favorable results, showing the presence of UV-absorbing phytoconstituents. The entire spectrum scan revealed strong absorption bands in the 260-370 nm region, which are typical of different secondary metabolites such as flavonoids and phenolic substances. These compounds have conjugated double bond systems and aromatic rings, resulting in significant UV absorption. Peaks at 270-290 nm indicate phenolic chemicals, whereas absorption at 330-370 nm indicates flavonoids. These data demonstrate that the sample includes bioactive phytochemicals capable of producing different spectral patterns, hence supporting the positive UV spectral analysis results.

Fig. No. 7: UV-VIS Absorbance Spectrum of Momordica dioica



3. Evaluation of Momordica Dioica Roxb Tea Bag Formation

- **Sensory Assessment**

Color – The herbal tea powder derived from Momordica Dioica Roxb. Generally, varies between light brown and muted green and prepared tea was medium to dark amber brown**.**

Fig. No. 8: Visual Appearance Momordica Dioica Roxb Herbal Tea

Aroma – The fragrance of Momordica Dioica Roxb. herbal tea powder is distinguished by a gentle, earthy aroma accompanied by faint vegetal notes, which highlight its organic nature.

Flavor – The herbal infusion made from Momordica dioica Roxb. presents a slightly bitter, earthy taste accompanied by delicate vegetal notes. This flavor profile is typical of various herbal teas sourced from gourd family species, providing a refreshing and calming experience. The bitterness is gentle and is frequently balanced by a soft, mellow aftertaste, rendering it enjoyable for frequent drinking.

Mouthfeel – The texture experienced when consuming the brewed Momordica dioica Roxb. herbal tea is generally characterized as smooth with a slightly astringency.

- **Brew Performance / Infusion Analysis**

Clarity: Assess the infusion for any presence of sediment or cloudiness.

Color: The tea made from herbs exhibited a medium to dark amber brown hue.

Duration for Full Infusion: Typically achieved within 3 to 7 minutes in hot water.

Fig. No. 9: Observation of Brew Color and Timing During Infusion of Herbal tea

Final Volume Post-Brewing: The final volume after 5 minutes of steeping in 100 ml of boiling water was found to be 80 ml.

4. pH Evaluation

The Momordica dioica Roxb. tea bag steeped in distilled water, the infusion was filtered, and pH measured using a digital pH meter and found to be 6.86.

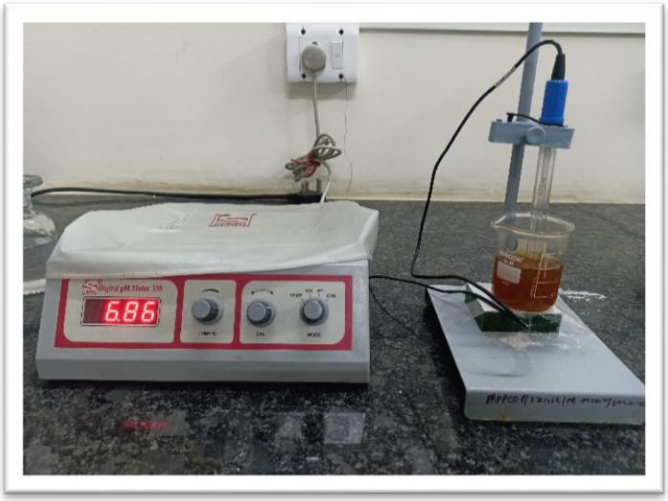


Fig. No. 10: pH Measurement of M. Dioica Herbal Tea Using Digital pH Meter

5.Moisture content

The moisture content of the tea bag formulation containing *Momordica dioica* Roxb. was determined using a gravimetric method. The initial (wet) weight of the tea bag is 23.0g before drying. The sample was then subjected to drying in a hot air oven at 105 °C for a period of 4 to 6 hours, or until a constant weight was achieved. Post-drying, the tea bag was cooled in a desiccator to prevent moisture reabsorption and subsequently weighed to obtain the dry weight and dry weight was found to be 21.62g.

Using the formula:

Moisture Content (%) = (Wet Weight - Dry Weight) / Wet Weight × 100

= (23.0 - 21.62) / 23.0 × 100

= 6%

the percentage of moisture present in the tea bag was calculated and found to be 6%. This result reflects the efficiency of the drying process and ensures that the tea bag formulation maintains optimal stability and quality. A low moisture content confirms the reduction of microbial growth risk and helps preserve the integrity of the herbal constituents.

5. Microbial loading

In order to investigate the possibility of bacterial and fungal contamination, a microbiological evaluation of the tea bag formulation including Momordica dioica Roxb. was carried out using the agar plate method. Using aseptic methods, a representative sample was extracted from the contents of the tea bag and placed onto sterile nutrient agar plates. To avoid external contamination, all tools—including forceps and inoculating loops were disinfected before use.

The inoculation plates were incubated for 24 to 48 hours at 37°C in order to detect the total live bacterial count. A different set of plates was incubated for three to five days at 25°C in order to measure fungal contamination. Following the appropriate incubation times, the plates were checked for the development of microorganisms.

The morphology, color, and size of the colonies were evaluated. The findings showed whether microbial colonies were present or not.

This microbial study helps guarantee adherence to safety regulations and validates the tea bag formulation's microbiological purity. When there is little to no observable microbial contamination, the product is safe to eat and can be stored properly.

Fig. No. 11: Microbial Loading Test of M. Dioica Tea Bags

6.Evaluation of Antidiabetic Potential Using *Aspergillus niger* as a Model Organism:

The antidiabetic potential of the formulated tea bags was evaluated using Aspergillus niger as a biological model due to its ability to produce carbohydrate-metabolizing enzymes, particularly α-glucosidase, which plays a key role in the breakdown of complex sugars into glucose. In this assessment, the fungal strain was cultured on a suitable agar medium, and discs infused with the tea bag extract were placed on the surface of the inoculated plates. After an incubation period, a distinct zone of inhibition was observed around the discs containing the tea extract. This clear zone indicates that certain phytochemicals present in the tea have inhibited either the growth of Aspergillus niger or the activity of its enzymes.

The inhibition can be interpreted as a suppression of α-glucosidase or other glycosidic enzymes, which are analogous to those found in the human digestive system. By inhibiting these enzymes, the tea extract may reduce the rate at which carbohydrates are broken down and absorbed as glucose in the body, thus helping to manage postprandial blood sugar levels. This mode of action is similar to that of pharmaceutical α-glucosidase inhibitors used in the treatment of type 2 diabetes. Therefore, the observed inhibition zone provides preliminary evidence that the tea bags may contain bioactive constituents with potential antidiabetic effects, supporting their further investigation as a natural therapeutic or dietary supplement for glycemic control.

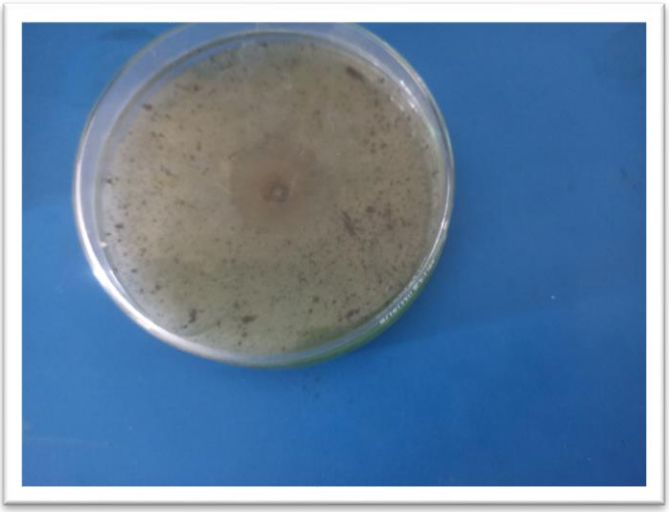


Fig. No. 12: Anti-diabetic Activity Assay using Aspergillus niger

7. Uniformity of mass of tea bag:

To guarantee that the tea bag formulation containing Momordica dioica Roxb. could be filled automatically and that the dosage would remain constant during manufacturing, its flowability was evaluated. The assessment comprised typical flow property measurements such as Hausner ratio, bulk density, tapped density, Carr's compressibility index, and angle of repose.

Sr. No.	Evaluation Parameter	Result
1	Angle of Repose	25.08^0
2	Bulk Density (ρb)	0.384g/ml
3	Tapped Density (ρt)	0.454g/ml
4	Carr's Compressibility Index (%)	7 %
5	Hausner Ratio	0.845

Table no. 04: Flowability Evaluation

According to these findings, the tea bag formulation has good flow properties that facilitate effective and consistent filling throughout manufacturing. By reducing the possibility of dosage variation, machine clogs, and irregular bag weights, this preserves the quality of the final product and the dependability of the process.

SUMMARY AND CONCLUSION:

Tea is an energizing and aromatic drink. People all over the world have been consuming tea for various health-promoting purposes. We formulated an herbal tea using *Momordica dioica* (spiny gourd) in tea bags. This tea is prepared using a quick and convenient method. All ingredients used in the *Momordica dioica* tea are commercially available.

The main ingredient in our tea is *Momordica dioica*, a medicinal plant known for its antidiabetic, antioxidant and anti-inflammatory properties. *Momordica dioica* plays a significant role in the management of diabetes due to its potent bioactive compounds. It helps lower blood glucose levels through its natural hypoglycemic activity, making it beneficial for individuals with type 2 diabetes.

Momordica dioica is traditionally used in Ayurveda to support the immune system, regulate blood sugar levels, detoxify the body, aid digestion, and support liver health. Compared to caffeinated teas, our *Momordica dioica* tea is naturally caffeine-free. Drinking this tea not only promotes relaxation but also supports overall health and well-being. Therefore, we conclude that *Momordica dioica* tea is a beneficial herbal beverage that should be consumed regularly for its antidiabetic, health-enhancing and stress-relieving effects.

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