Project On

A Review on Antidiabetic Plants in Bangladesh

Submitted To

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In the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy

Submitted By

Student ID: 183-29-1364

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Faculty of Allied Health Sciences

Daffodil International University

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APPROVAL

This project, A review on Antidiabetic Plants in Bangladesh, submitted to the Department of Pharmacy, Faculty of Allied Health Sciences, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy and approved as to its style and contents.

BOARD OF EXAMINERS

……

Dr. Muniruddin Ahmed
Professor and Head
Department of Pharmacy
Faculty of Allied Health Sciences
Daffodil International University

…… Internal Examiner 1

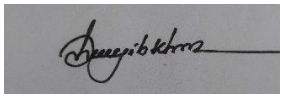
…… Internal Examiner 2

…… External Examiner

CERTIFICATE

This is to certify that the results of the investigation that are embodied in this project are original and have not been submitted before in substance for any degree of this University. The entire present work submitted as a project work for the partial fulfillment of the degree of Bachelors of pharmacy, is based on the result of author's (Md: Hasibul Haque Shihab, Id: 183-29-1364) own investigation.

Supervised by



……

Mr. Md. Shajib Khan

Lecturer,

Department of Pharmacy

Faculty of Allied Health Sciences

Daffodil International University

DECLARATION

I hereby declare that, this project report is done by me under the supervision of, Mr. Md. Shajib khan, lecturer, Department of Pharmacy, Daffodil International University, in the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy. I am declaring that this Project is my original work. All information that was evolved from literature has been duly acknowledged in the text and list of references provided.

Name of the Student: Md. Hasibul Haque Shihab

Date: 21-11-2022

Signature

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DEDICATION

This project work is dedicated to my parents, brothers and teachers for their deep amicable support and help.

ABSTRACT

One of the primary metabolic diseases, diabetes mellitus, affects 2.8% of people worldwide and is expected to reach 5.4% by 2025. Since herbal remedies have long been a highly regarded source of medicine, they are now a growing component of contemporary, high-tech medicine. My aim of this study was use in controlling insulin resistance associated with diabetes & to see the Antidiabetic Plants use in Bangladesh. This study was conductedthrough a literature review. Around 88 papers are reviewed for this study. This exploration was planned through google scholar, PubMed, and many other websites to find literature. Around fruit(14%), the whole plant (12%), the root (11%), the seed (11%), the bark (9%), the stem (6%), the flower (3%), and the rhizome (1%) are used as an antidiabetic plant in Bangladesh. The therapy of diabetes mellitus utilizing these plants and their active principles is also included in the review.

Keywords: Antidiabetic, Pharmacological, Hyperglycemia, Drug.

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Introduction,

1.1. Diabetes

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia (high blood sugar levels) (or diabetes mellitus). Increases in urination, thirst, and appetite are common symptoms. Several potentially fatal complications may arise from unchecked diabetes. Hyperosmolar hyperglycemic state, diabetic ketoacidosis, and death are all potential immediate results of uncontrolled diabetes. There are several very significant long-term effects, including [2] heart disease, stroke, chronic kidney illness, foot ulcers, nerve damage, eye damage, and cognitive impairment. [3] It's possible that the pancreas isn't producing enough insulin, or that the cells in the body aren't responding well enough to the insulin that is being generated. Insulin is a hormone that facilitates glucose's entrance into cells to be used as fuel. There are three possible types of diabetes mellitus: The inability to produce enough insulin leads to type 1 diabetes when beta cells die off in the pancreas. Once known as insulin-dependent diabetic mellitus or juvenile diabetes, these terminologies have now been replaced. Beta cells are destroyed when the immune system attacks the body. Yet it is not known what sets off this autoimmune response. Although adults may be diagnosed with type 1 diabetes, it more often affects children and teenagers. Type 2 diabetes has its roots in the illness known as insulin resistance, in which cells no longer respond appropriately to insulin. Later in the course of the disease, insulin insufficiency may develop. Adult-onset diabetes, or non-insulin-dependent diabetes mellitus, was formerly the medical term for this condition. The majority of people with type 2 diabetes are over the age of 60, but the rising rates of childhood obesity have contributed to an increase in the disease's incidence among younger people. The most common risk factors are being overweight and inactive. Finally, the third of the big three is diabetes that develops during pregnancy but usually only in women who have never had the disease before. Women with diabetes often see their blood sugar levels return to normal after giving birth. Women who have had gestational diabetes are more likely to develop type 2 diabetes later in life. Type 1 diabetes can only be treated with insulin injections. Preventing and effectively managing type 2 diabetes requires attention to dietary habits, physical activity levels, body mass index, and cigarette use. If you have type 2 diabetes, you may control your condition using oral antidiabetic medications in combination with or instead of insulin. [4] Those who suffer from this ailment should pay special attention to the well-being of their feet and eyes, and take measures to keep their blood pressure under control. Low blood sugar levels can be fatal when

taking certain oral medications like insulin (hypoglycemia). Patients with type 2 diabetes and obesity may benefit from bariatric surgery [5-6] After delivering birth, many women no longer have type 2 diabetes. [7]

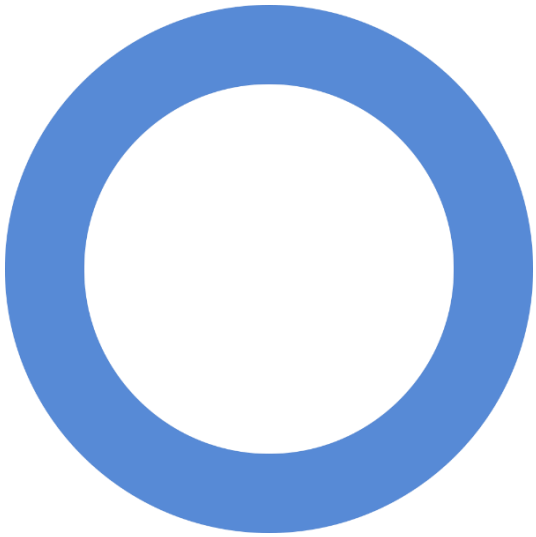


Fig 01: Diabetes symbol

Type 2 diabetes, which affects around 8.8% of the world's adult population, was diagnosed in 90% of the 463 million people with Diabetes in 2019. Rates for men and women are almost the same. [8] Most people now believe that interest rates will rise further. Having Diabetes at least doubles your risk of dying young. This year, diabetes is expected to claim the lives of over 4.2 million people worldwide. Why it's the world's sixth leading cause of death. [9-10] It was estimated in 2017 that worldwide healthcare expenses connected to diabetes will total $727 billion. Spending in the United States in 2017 due to diabetes was close to $327 billion. [11] Medical treatment for diabetics is typically around 2.3% more expensive than the national average. [12]

1.2. History of Diabetes

One of the first ailments to be documented was diabetes, which was referred to as "too much emptying of the urine" in an Egyptian literature from about 1500 BCE [13]. To alleviate these symptoms, the Eber’s papyrus recommends drinking a certain liquid. In all likelihood, type 1 diabetes was the first form of the disease to be diagnosed and recorded. Traditional Indian medicine

practitioners used the term "honey urine" (or "madhumeha") to describe the ailment. Diabetes isa term that was first used by a Greek physician, Apollonius of Memphis, around 230 BCE. The word comes from the Greek meaning "to pass through." One of the most well-known Roman physicians, Galen, said he had only encountered two cases of the illness during his whole career. The old diet and way of life, or the detection of clinical indications late in the course of the disease, are also possible causes. Galen referred to this condition as "Diarrhea of the Urine" (diarrhea urinosa). [14-15] Aretaeus of Cappadocia authored the first known work, which provides a thorough analysis of diabetes (2nd or early 3rd century C.E.). Outlining the disease's symptoms and course, he blamed the "Pneumatic School's" holy environment and humidity. Diabetes, he hypothesized, was related to other diseases, and he discussed distinguishing its symptoms from those of snakebite, another potential source of severe dehydration. He was mostly unknown in the Western world until 1552, when the first Latin translation of his book appeared in Venice. [16] Indian physicians Sushruta and Charaka identified two types of Diabetes, one connected with youth and the other with obesity, about 400–500 CE. Insulin, which was developed and perfected by Canadian researchers Frederick Banting and Charles Herbert Best in 1921 and 1922, is the most successful treatment for diabetes to date. Next, in the 1940s, NPH (a very long-acting form of insulin) was developed.

1.3. What are the types of Diabetes?

- Type 1 diabetes.
- Type 2 diabetes.
- Gestational Diabetes.
- Maturity onset diabetes of the young (MODY)
- Neonatal Diabetes.
- Wolfram Syndrome.
- Alstrom Syndrome.
- Latent Autoimmune Diabetes in Adults (LADA)

Type 1 diabetes

Type 1 diabetes, or T1D, is an autoimmune condition in which the body's immune system mistakenly attacks its own insulin-producing cells (beta cells). A hormone called insulin is required for glucose to be used as fuel by cells. This leads to hyperglycemia if treatment is not

administered. [17] Increased urination, thirst, hunger, and weight loss are the most common symptoms of high blood sugar, all of which may be unpleasant and even harmful. [18] It may manifest in poor eyesight, tiredness, and wound healing. Within a few weeks, most individuals have symptoms. The actual cause of type 1 diabetes is unknown, but both genetic and environmental factors have been implicated (19). The immune system attacks and kills the pancreatic beta cells that create insulin. Diabetics may be diagnosed with a blood test for sugar or glycated hemoglobin (HbA1C). In order to definitively distinguish type 1 from type 2 diabetes, autoantibody testing is essential. Most occurrences of type 1 diabetes have no preventable causes. Insulin treatment is crucial for survival. Those who need insulin therapy have another option than subcutaneous injections in the form of the insulin pump. [20] Diabetic therapy include eating well and exercising regularly. Diabetic complications might increase if the disease is not treated. Particularly rapid-onset consequences include diabetic ketoacidosis and nonketotic hyperosmolar coma. Cardiovascular disease, stroke, renal failure, foot ulcers, and vision loss are some of the long-term effects. Because insulin lowers blood sugar, ingesting too much of it may lead to dangerously low blood sugar levels. [21-13] The percentage of type 1 diabetes among all patients is estimated to be between 5 and 10 percent. Exactly how many people are affected is unknown. Nonetheless, it is estimated that every [24] more than 80,000 children over the globe get the disease. Between one and three million Americans might be affected. Whereas East Asia and Latin America experience about one new case per 100,000 people per year, Scandinavia and Kuwait see closer to thirty new cases per 100,000 people each year. [25] In most cases, the onset of symptoms occurs in younger people.

Type 2 diabetes

Type 2 diabetes, also called adult-onset diabetes, is characterized by high blood sugar, insulin resistance, and an inadequate supply of insulin. Symptoms often include excessive urination, increased thirst, and unexplained weight loss. Other potential symptoms include an increased hunger, extreme tiredness, and wounds that fail to heal. Symptoms often develop with time. Long-term repercussions of high blood sugar include cardiovascular disease, stroke, blindness due to diabetic retinopathy, renal failure, and inadequate blood flow in the limbs that may lead to amputations. Though ketoacidosis is uncommon, a hyperosmolar hyperglycemic state may develop rapidly. Most cases of type 2 diabetes may be attributed to either obesity or a lack of

physical exercise. Natural variations in sensitivity exist between people [26]. The vast majority of those diagnosed with Diabetes have type 2, with type 1 and diabetes connected to pregnancy making up the remaining 10%. Patients with type 1 diabetes have a more difficult time maintaining healthy blood glucose levels because their pancreatic beta cells, which produce insulin, are destroyed by their own immune systems. [27-28] Possible blood tests for diagnosing Diabetes include fasting plasma glucose, the oral glucose tolerance test, and glycated hemoglobin (A1C). The risk of acquiring type 2 diabetes may be reduced or eliminated entirely with weight maintenance, frequent physical exercise, and a good diet (high in fruits and vegetables and low in sugar and saturated fats). Among the measures included in the therapy are alterations to the patient's diet and the encouragement to maintain an exercise routine. If metformin fails to bring about a decrease in blood sugar levels, insulin may be recommended as an alternative. Many people may need to take insulin shots. Some people using oral drugs may not need to test their blood sugar as often as others who use insulin. In most cases, bariatric surgery helps diabetic patients. Type 2 diabetes has seen a meteoric increase in frequency since the 1960s, right along with the epidemic of obesity. The number of people with this diagnosis increased from from 30 million in 1985 to about 392 million in 2015. Type 2 diabetes is becoming more common in younger age groups; however this condition does not often appear until middle life or later. Those with type 2 diabetes should expect to live 10 years less than the general population. [30] The oldest written account of diabetes dates back to about 1500 BCE, and it was written in Egyptian literature. [31] The therapeutic value of insulin was first recognized in the 1920s. [32]

Gestational Diabetes

Gestational Diabetes is the medical term for high blood sugar levels that develop during pregnancy. Gestational diabetes has little symptoms, but it may increase the chances of developing pre-eclampsia, depression, and the need for a C-section. Babies born to mothers whose gestational Diabetes was not well controlled were more likely to be born big for their gestational age, to have postnatal hypoglycemia, and to develop jaundice. Untreated diabetes increases the risk of having a stillborn child [33]. Overweight children, in particular, have elevated long-term risks of obesity and type 2 diabetes [34]. Gestational Diabetes occurs when either insulin resistance or reduced insulin production occurs during pregnancy. Factors that increase the likelihood of developing diabetes include being overweight, a family history of the disease, polycystic overin

and pregnancy. The diagnosis is made by taking a blood sample. Women of average risk should be checked between the 24th and 28th week of pregnancy, as recommended [35]. It has been suggested [36, 37] that a high-risk pregnant woman might be checked as early as the first prenatal checkup. Taking preventative steps, such maintaining a healthy weight and engaging in regular exercise, might be beneficial. When managing gestational diabetes, it may be required to use insulin injections in addition to a diabetic diet and frequent exercise. Blood sugar levels in most women can be managed with adjustments in diet and exercise. Patients are advised to monitor their blood sugar levels four times daily. As soon as possible after giving birth, breastfeeding should begin. About 3–9% of pregnant women in the study population had diabetes. This is a common occurrence [38] in the third trimester of pregnancy. A little over 1% of individuals under the age of 20 and around 13% of those over the age of 44 have it. Those of certain races or ethnicities are disproportionately at risk. People of Asian, American Indian, Indigenous Australian, and Pacific Islander origin are included in this category. In 90% of cases, gestational diabetes goes away once the baby is born. Still, type 2 diabetes is more common in women than males [39].

Latent Autoimmune Diabetes in Adults (LADA)

The clinical manifestations of latent autoimmune diabetes in adults (LADA), also known as slowly developing immune-mediated diabetes, are similar to those of both type 1 and type 2 diabetes (T2D). Individuals with LADA often demonstrate insulin resistance similar to those with type 2 diabetes (T2D), and they share certain risk factors for T2D with those who have T2D. According to the study, people with LADA have antibodies against the cells that create insulin, and the pace at which these cells stop producing insulin is slower in LADA patients than in T1D patients. [40] However, it seems that LADA has risk factors with both T1D and T2D while being genetically distinct from both. Insulin resistance and autoimmunity in patients with LADA have been reported to range from modest to severe, indicating genetic and phenotypic heterogeneity. The common phenotype and genotype of LADA, as well as its intra-clinical variability in terms of autoimmune and insulin resistance, suggest that it may be viewed of as a cross between type 1 and type 2 diabetes. The International Diabetes Federation and the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, which both include type 1 diabetes in their standard definitions, do not accept the term LADA, which was created in 1993[41].

1.4. Diabetes Symptoms

- Urinate (pee) a lot, and most of the time throughout the night
- Are you suffering from extreme parchedness
- We'll shed pounds even if you don't try.
- Are incredibly hungry
- Have eyesight that is hazy.
- Have tingling or numbness in your hands and feet.
- Feeling really worn out
- Have severely dry skin
- Have wounds that heal slowly yet steadily
- Have a greater number of infections than normal

1.5. Causes

What causes type 1 diabetes?

Type 1 diabetes occurs when the immune system (the body's defense against infection) attacks and destroys the beta cells in the pancreas that produce insulin. Scientists believe that environmental factors, such as infections and genetic predispositions, might precipitate the onset of type 1 diabetes [42]. Trial Net External link is one example of a study looking at the causes of type 1 diabetes in an effort to find a cure.

What causes type 2 diabetes?

Type 2 diabetes, the most common kind, has several causes in both genes and environmental factors.

Overweight, obese, and physically inactivity

Type 2 diabetes prevalence increases with inactivity, excess weight, and obesity. Type 2 diabetics often suffer from insulin resistance as a complication of their weight problems. The outcomes are also affected by the way fat is distributed throughout the body. Excess abdominal fat has been linked to an increased risk of developing type 2 diabetes, insulin resistance, and cardiovascular

disease. Use these Body Mass Index (BMI) tables to determine your level of risk for developing type 2 diabetes depending on your current weight. [43]

Insulin resistance

Insulin resistance, a condition in which the body's muscle, liver, and fat cells do not respond normally to insulin, is often the first indicator of impending type 2 diabetes. As a result, your body needs more insulin to help glucose enter cells. The pancreas responds to a rise in demand for insulin by producing more of the hormone. Over time, the pancreas's failure to generate enough insulin causes blood glucose levels to rise.

Genes and family history

Similar to type 1 diabetes, having certain genes may increase your risk of developing type 2 diabetes. These racial/ethnic groups are more likely to experience the illness, which tends to run in families:

- ✓ Black Americans
- ✓ Native Alaskans
- ✓ Indian Americans
- ✓ American Asians
- ✓ Hispanics/Latinos
- ✓ Hawaiian natives
- ✓ Caribbean Islanders

Genes may also make someone more likely to develop type 2 diabetes by making them more likely to be overweight or obese.

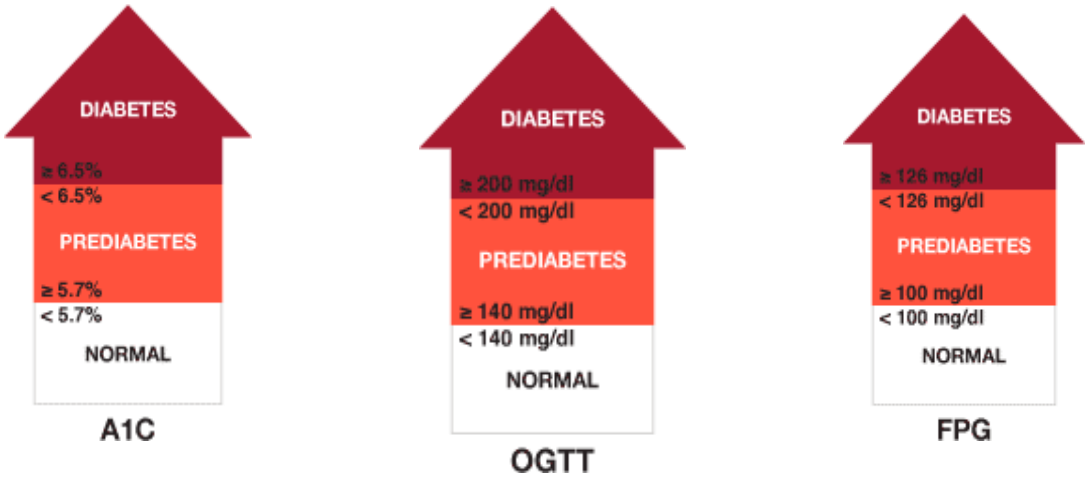
What causes gestational Diabetes?

Scientists believe that the hormonal changes associated with pregnancy, in addition to genetic and environmental variables, are the root causes of Gestational Diabetes.

Insulin resistance:

In late pregnancy, insulin resistance is universal due to placental hormones. Unfortunately, some expectant mothers do not produce enough insulin to effectively treat their insulin resistance. gestational diabetes occurs when the pancreas does not produce enough insulin. Pregnancy-related diabetes is associated with weight gain in the same way as type 2 diabetes is. Women who are very overweight or obese may already have insulin resistance. It's also possible that eating too much during pregnancy is a factor. [44-46]

1.6. Diagnosis



Diabetic diagnosis may include more than one test. Testing both methods is usually necessary to confirm a diabetes diagnosis, which might add a second day to the process. Tests should be performed in a clinical setting, such as a hospital or private laboratory. If your doctor discovers that your blood glucose (blood sugar) level is very high, or if you also exhibit the typical symptoms of high blood glucose, a single positive test may be sufficient to diagnose Diabetes.

A1C

The A1C result is a summary of your blood glucose levels over the previous 1-2 months. The approach has the added advantage of not requiring you to go without eating or drinking before the test. Diagnosis of diabetes is made with an A1C level of 6.5% or above.

A1C

Normal less than 5.7%

Prediabetes 5.7% to 6.4%

Diabetes 6.5% or higher

Fasting Plasma Glucose (FPG)

Patients who are fasting have their blood glucose levels checked. Fasting is defined as abstaining from all food and drink (other than water) for at least 8 hours before to a medical checkup. Commonly, this inspection is done first thing in the morning before eating anything. A diagnosis of diabetes mellitus is made if a person has a fasting blood sugar level of 126 mg/dl or above.

Fasting Plasma Glucose (FPG)

Normal less than 100 mg/dl

Prediabetes 100 mg/dl to 125 mg/dl

Diabetes 126 mg/dl or higher

Oral Glucose Tolerance Test (OGTT)

The OGTT checks your blood sugar levels before and after you drink a particular sweet drink. This test might tell doctors a lot about how efficiently or badly your body processes sugar. After two hours of fasting, a blood glucose level of 200 mg/dl or above is considered diagnostic of Diabetes.

Oral Glucose Tolerance Test (OGTT)

Normal less than 140 mg/dl

Prediabetes 140 to 199 mg/dl

Diabetes 200 mg/dl or higher

Random (also called Casual) Plasma Glucose Test

A blood test may be done if there are serious signs of diabetes. A diagnosis of Diabetes may be obtained if blood glucose levels are above 200 mg/dL. [47-49]

1.7. Diabetes Treatments

Diabetes patients must strictly adhere to their medication schedules. Diabetics should never disregard their disease since doing so might lead to catastrophic outcomes. Complications may include renal failure (or other organ failure), blindness, the need for amputation of toes or feet, and even death (especially from cardiovascular disease). If you have Diabetes, you may greatly reduce your risk of developing a diabetic complication by taking your medication as directed. Treatment is a combination of dietary and physical activity changes and pharmaceuticals (if needed). Tablets, insulin, and other injectable treatments are only some of the options for controlling Diabetes. Injections of insulin are a permanent need for those with type 1 diabetes. While many people with type 2 diabetes can control their blood sugar levels with oral drugs, others may eventually need to convert to insulin. [50]

Endocrine Connection

Treatment options are specific for each diabetes subtype. Diabetes comes in a variety of forms, including but not limited to the following:

- A diagnosis of type 1 diabetes is made when the pancreas stops making insulin. Anyone of any age is at risk, but children and teens are particularly vulnerable. In order to maintain life, persons with type 1 diabetes need to take insulin.
- While type 2 diabetes is the most common kind, it is not the only one. Insulin production diminishes and insulin resistance develops in people with type 2 diabetes. There is a disproportionate impact on adults, particularly the overweight. However, the increased vulnerability to acquiring type 2 diabetes is not exclusive to the elderly.
- Gestational diabetes is a kind of diabetes that only appears during pregnancy. Thankfully, most women report that their symptoms go away after giving birth. The risk of type 2 diabetes in later life is higher for women who have had gestational diabetes. Many different classes of drugs are available for medical prescription. It's not necessary to memorize all the names and technical phrases, but you should know that there ARE alternatives available to you since the sheer number of them might be intimidating. [51-52]

1.8. Plants

Members of the eukaryotic kingdom Plantae rely on sunlight for the vast majority of their energy needs. Once upon a time, all creatures not belonging to the animal kingdom were considered part of the plant kingdom. However, prokaryotes and certain algae are not included in current definitions of Plantae (the archaea and bacteria). One grouping of plants is called Viridiplantae (Latin for "green plants"), which contains green algae and Embryophyta and is sister to Glaucophyta (land plants). Flowers, trees, ferns, hornworts, liverworts, and mosses all belong within the second group of plants. Multicellular organisms make up the great bulk of plant species. Green plants get most of the energy they require from photosynthesis, which is carried out by primary chloroplasts that are created via endosymbiosis with cyanobacteria. The presence of chlorophylls a and b in their chloroplasts gives them their characteristic green color. While flowers, fruit, and seeds may be produced by parasitic or mycotrophic plants, these plants cannot develop normally because they lack chlorophyll and photosynthesis. Sexual reproduction and generational alternation are hallmarks of plant life, even if asexual reproduction is common in plants. Somewhere between 260.000 and 290.000 of the 320 000 plant species currently known produce viable seed. [53] Green plants not only provide the molecular oxygen necessary for most of Earth's ecosystems to function, but they also offer a significant portion of the world's food supply. Humans have been cultivating grains, fruits, and vegetables for generations since they are essential to a healthy diet. Since ancient times, people have turned to plants for a wide variety of purposes, including but not limited to food, medicine, fiber for clothing and paper. The study of plants and their environment is known as botany, which is a branch of biology. [54]

1.9. Medicinal plants

Finding and using therapeutic plants, often known as medicinal herbs, has been central to traditional medical practices since ancient times. For several reasons, including defense against herbivorous animals, insects, fungus, and diseases, plants create a vast range of compounds. Recent years have seen the discovery of several phytochemicals with shown or expected biological function. Since a single plant might contain a variety of phytochemicals, the advantages of using the whole plant as a treatment remain uncertain. There is a lack of thorough scientific research on the phytochemical composition and pharmacological activity, if any, of many plants with

medicinal promise. [55] The Sumerian civilisation, which was at its peak about 3000 B.C., left behind clay tablets detailing hundreds of medicinal herbs, including opium. The Ebers Papyrus, written about 1550 B.C. in ancient Egypt, has a list of almost 850 plant cures. Dioscorides, a Greek physician who served in the Roman army in the year 60 A.D. and wrote the treatise De materia medica, which established the basis of pharmacopeias for the next 1500 years. Hundreds of compounds having pharmacological action have been identified as a consequence of ethnobotanical investigations that were done as part of drug development activities. Common drugs include aspirin, digoxin, quinine, and opium. Plants may contain a wide variety of molecular kinds. Alkaloids, glycosides, polyphenols, and terpenes are the four biochemical classes into which they fall. Medicinal plants are often used in nations that have not yet developed a manufacturing sector because to their cheap cost and great availability. The estimated annual export value of the hundreds of plant species bearing medicinal qualities was US$2.2 billion in 2012. [56] The global market for plant extracts and medicines was expected to be worth billions of dollars as of 2017. Because of the lack of regulation in certain countries, the World Health Organization (WHO) has established a network to encourage the responsible and healthy use of traditional medicine. In addition to systemic challenges like climate change and habitat loss, over-collection to meet commercial demand is a specific worry for medicinal plants.

1.10. Some Medicinal plants in Bangladesh

Indian bael

The Aegle marmelos tree is an endangered species found in India and Southeast Asia. It goes by many other names, including bael, Bengal quince, golden apple, bitter Japanese orange, stone apple, and wood apple. Golden apple, bitter Japanese orange, stone apple, and wood apple are some of the other names for this tree. In addition to its native range, naturalized populations have been documented in the neighboring nations of India, Bangladesh, Sri Lanka, and Nepal.

Fig 02: Indian bael

Myrobalan

In addition to its common names, Terminalia chebula is also known as black myrobalan and chebulic myrobalan. Its native habitats include the subcontinents of India and Nepal, southwest China, Sri Lanka, Malaysia, and Vietnam.

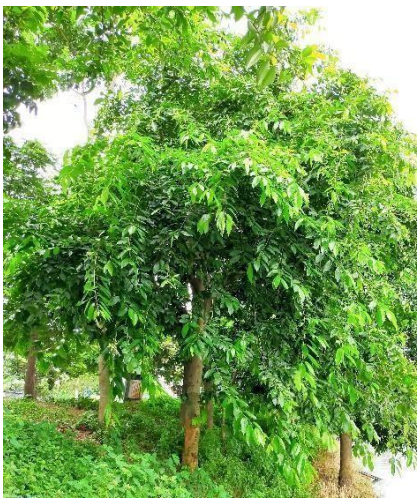


Fig 03: Myrobalan

Arjun tree

The Terminalia arjuna tree is a member of the Terminalia genus. Arjuna or Arjun tree are two common English names for this plant.

Fig 04: Arjun tree

Golden shower tree

The Fabaceae family includes the flowering plant species known as *Cassia fistula*. In addition to its more common names, this tree goes by the names pudding-pipe tree, Indian laburnum, purging cassia, and golden shower. The cassia fistula plant is grown in the tropics and subtropics for its decorative flowers. The best conditions for flowering are high temperatures and low humidity, which often occur in late spring or early summer. During the peak of the blossoming season, trees are covered with bright yellow blossoms. It thrives in dry, sunny climates. Optimal development conditions for this tree include full sun and well-drained soil, and it can withstand average dryness and low salt concentrations. While it may be able to withstand some frost, extended exposure to freezing temperatures may be harmful.

Fig 05: Golden shower tree

Mangifera indica

The mango, also known scientifically as *Mangifera indica*, is a species of flowering plant that belongs to the family Anacardiaceae. It is a huge fruit tree that has the potential to reach a height of thirty meters. The "Indian type" and the "Southeast Asian type" of mangoes are the two separate genetic groups that are found in contemporary mangoes.

Fig 06: Mangifera indica

1.11. Some Antidiabetic plants in Bangladesh

Bombax ceiba

Cotton trees, including the *Bombax ceiba* tree, are popular names for many species in the genus Bombax. More specifically, it is also known as the Malabar silk-cotton tree, red silk-cotton, and red cotton tree. Silk-cotton and kapok [57] may also refer to Ceiba pentandra, therefore there is some ambiguity in the names. This tall, slender, and straight-trunked tropical tree is indigenous to Asia and is categorized as a deciduous tree due to its leaves' seasonal shedding. Red, five-petaled flowers appear in the spring before the new leaves grow. When mature, the capsule it produces is filled with cotton-like white threads (ref. To protect itself from predators, it has spikes along its trunk. The tree seems as like it may be used for timber due to its huge trunk, but the wood is much too soft to be of any real use.

Fig 07 : Bombax ceiba

Bryophyllum pinnatum (Lam.) Oken

Inflammation, infections, anxiety, restlessness, and sleep difficulties are just some of the many ailments that the *Bryophyllum pinnatum* (Lam.) Oken plant is used to treat. To yet, it has not been determined if the crude extracts of B.P. have more beneficial or dangerous effects, despite the fact that it is generally known that B.P. leaves contain a high concentration of flavonoids.

Fig 08: Bryophyllum pinnatum (Lam.) Oken

Caesalpinia

Caesalpinia is a genus of flowering plants in the family Fabaceae. It has been notoriously difficult to nail down exactly how many species are included in the genus. The number of recognized species in this genus varies from 70 to 165, depending on the source. Whether or whether a certain species is also classified as a Hoffmannseggia affects its potential distribution. Hardy trees and shrubs from the tropics and subtropics are included. It was with great respect for the Italian botanist, physician, and philosopher Andrea Cesalpino that the decision to name the generic medication in his honor was made (1519–1603). [59] This generic name served as the foundation for the naming of the Caesalpinaceae family and the Caesalpinioideae subfamily.

Fig 09 : Caesalpinia

Cocos nucifera L

There is just one living species of the palm tree family Arecaceae, and that is the coconut palm (*Cocos nucifera*). The botanical classification of the coconut fruit is that of a drupe rather than a nut, however the term "coconut" (also written "cocoanut") may apply to the complete coconut palm, the seed, or the fruit. The Portuguese word for "head" or "skull" is where the name "coconut" originates from; the fruit was given that moniker because of the three indentations seen on its husk that are reminiscent of the features of a human face. It is a cultural icon of the tropical regions where it may be seen all along the coastlines. The coconut palm is used for many different things, including food, fuel, cosmetics, traditional remedies, and construction materials. The flesh contained within the ripe seed and the milk extracted from the seed make up a considerable percentage of the diets of many people who reside in the tropics and subtropics. Coconuts are distinct from other fruits because their endosperms are packed with a clear liquid known as coconut water or coconut juice. The mature, ripe coconut may be eaten for its seeds or processed for its oil, plant milk, charcoal, or coir. Dried coconut flesh, known as copra, and the oil and milk that may be recovered from coconuts are used in several industries, such as the food and cosmetics sectors.

Drinks may be made from the delicious coconut sap, which can also be fermented into palm wine or coconut vinegar. The long, pinnate leaves, fibrous husks, and stiff shells may all be used to make various products that can be used to adorn and decorate a home. [60-61]

Fig 10: Cocos nucifera L

Chapter Two:

The Goal of My studies

Diabetes is a long-term illness that hinders your body's ability to convert food into usable fuel. Most of the food you consume is converted into glucose and absorbed by your body. When blood sugar levels rise, the pancreas responds by secreting insulin. Diabetes mellitus may be managed by using some plants that affect the body's glucose metabolism. All of these medications, except for insulin, pramlintide, and other GLP receptor agonists, are taken orally and are sometimes known as oral hypoglycemic medicines or oral antihyperglycemic drugs.

My aim of this study is,

- Demonstrate the current diabetic situation in Bangladesh.
- Accumulate the information of plant that has antidiabetic properties
- To the proportion of antidiabetic plant components used to treat Diabetes in Bangladesh.

Chapter Three:
Methodology

3.1. Introduction:

A literature review leads the examination. Around 88 papers are reviewed for this study.

3.2. Research Design:

This exploration was planned through google scholar, PubMed, and many other websites to find literature. Searching Key Word by antidiabetic plant, traditional medicine, herbal medicine or drug with no restriction.

3.3. Method of Data Analysis:

After an assortment of information, all information was checked for precision and internal consistency to deny missing or clashing data, and those were discarded. Information investigation was done through Microsoft's dominant refreshed rendition. All collected information is from 1980 to 2022.

Chapter four:
Findings and Discussion

4.1. The proportion of antidiabetic plant components used to treat Diabetes in Bangladesh.

Traditional forms of treating hyperglycemia are often more straightforward, less costly, and made from locally accessible herbs with hypoglycemic properties. One of the few herbal treatments with antidiabetic properties that attracted a lot of study interest. *They are Ficus racemose L., Ficus hispida L.f., Mangifera indica L., Centella asiatica L., Terminalia chebula L., and Momordica charantia L. Three species of corticolous Tinospora are Coccinia cordifolia L. Cogn, Aegle marmelos L. Corrêa, Coccinia grandis L. Voigt F. Hook, and Thoms. Bombax ceiba L., Trigonella foenum-graecum L., Tamarindus indica L., Kalanchoe pinnata (Lamk.) Pers., Cajanus cajan L. Millsp., Bombax ceiba L.,* and *Clerodendrum viscosum Vent*. The whole plant, including the leaf, fruit, flower, root, bark, rhizome, bulb, latex, and seed, is examined for possible anti-diabetic qualities. In terms of frequency of usage, the plant's leaf, which is utilized 32% of the time, is followed by the fruit (14%), the whole plant (12%), the root (11%), the seed (11%), the bark (9%), the stem (6%), the flower (3%), and the rhizome (1%).[62][63].

Parts of plants used in the treatment of Diabetes	Botanicals used to cure Diabetes, in part
Leaf	32%
Fruit	14%
The whole plant	12%
The root	11%
The seed	11%
The bark	9%
The stem	6%
The flower	3%
The rhizome	1%

Table 01: The proportion of antidiabetic plant components used to treat Diabetes in Bangladesh.

4.2. Long-standing usage as an effective diabetes treatment

After a thorough review of the literature, it was discovered that several plant components, including leaves, barks, seeds, fruits, stems, flowers, and in some instances, complete plants, are used to treat Diabetes. The majority of plants are utilized with water and eaten first thing in the morning. In Table 2, those formulas are listed [64][65].

Plants Name	Family	The formulation used in local areas of Bangladesh
A. paniculata	Acanthaceae	Diabetes is often treated using drugs made from the whole plant. Before breakfast in the morning, 5 mg of the entire plant's crude paste extract is consumed.
A. conyzoides	Asteraceae	Two spoonfuls of the entire plant's macerated form are consumed each day.
S. chirata	Gentianaceae	Diabetes is treated using chirata root and a honey concoction. It is consumed in doses of 1-2 g every morning.
T. arjuna	Combretaceae	2 hours after eating, consume 3-6 g of Berks in powdered or macerated form with milk.
A.indica	Meliaceae	Two to three tablespoons of the water-based leaf extract paste should be consumed every day on an empty stomach.

Table 02: The most typical conventional preparations of the highlighted plants.

4.3. Hypoglycemic effects of *A. paniculate*

The Aqueous *A. paniculata* extract reportedly showed possible inhibition of glucose-induced hyperglycemia in normal rabbits but no action against epinephrine-induced hyperglycemia, according to analyzing various articles. The blood glucose level in the fasting state is unaffected by six weeks of continuous dosing. *A. paniculata* and andrographolide, however, were shown to be able to cause hypoglycemia effects by obstructing the alpha-amylase and alpha-glucosidase enzymes, according to different research. By re-establishing the estrous cycle's impaired state, a strong antidiabetic efficacy was shown in alloxan-induced diabetic rats [66][67].

4.4. Wound-healing properties of *A. conyzoides*

For diabetes patients, the healing of regular wounds may be difficult; normal wounds often develop secondary infections and take a long time to heal in any case. The excision wound model is often used to quantify wound-healing activities, according to a study of various articles. It was discovered that 72% of the wounds in the group treated with the plant extracts had healed, but more than 90% of the wounds in the group treated with the plant extracts had after treating the model with plant extract and distilled water [68][69].

Group 1	Using plant extracts and distilled water, 72% of wounds were cured.
Group 2	90% of wounds were healed with only plant extracts

Table 03: Wound-healing properties of *A. conyzoides*

4.5. Diabetes and other functions are impacted by *Ocimum Sanctum L*. (tulsi).

The study's findings suggest that tulsi and neem leaves may treat people with Diabetes and high blood pressure by lowering their symptoms and blood pressure. After adding tulsi and neem leaf powder to the individuals' diets, there was no discernible change in their anthropometric measurements. In both healthy and alloxan-induced diabetic rats, the aqueous leaf extract significantly lowers blood sugar levels [70]. Additionally, it lowers total cholesterol, uric acid, fasting blood sugar, and hypolipidemia in diabetic and hypoglycemic rats. [71] Antioxidant, antibacterial, antifungal, antiviral, anti-asthmatic, antistress, anticancer, involvement of stomach ulcer, antimutagenic, and immunostimulant properties are only a few of the principal effects [72].

4.6. Medicinal plants of Bangladesh with antidiabetic activity and Probable mechanisms of action.

There are a lot of antidiabetic medicinal plants in Bangladesh, and their bioactive components and likely modes of action are given in table: 4 below, according to research from numerous articles [73].

Botanical name (Common Name)	Bioactive constituent(s)	Probable mechanisms of action
Acacia catechu (L.f.) Willd.	▪ Flavonoids	Encourage insulin production Encourage regrowth of Beta-cells
Adhatoda vasica Nees (Basak)	▪ Alkaloids	Reduce alpha-glucosidase activity
Aegle marmelos	▪ Tannins	Increase insulin secretion from pancreatic β-cell. Regulate the activity of carbohydrate metabolizing enzymes

Table 04: Bioactive constituent(s) and Probable mechanisms of action of medicinal plants.

Chapter five:
Conclusion

The study has provided a list of antidiabetic herbs that are used to treat diabetes mellitus. It shows that these herbs have hypoglycemic properties and may be utilized to treat different kinds of diabetes mellitus secondary problems. Although many plants and the medicinal chemicals extracted from them have not yet been thoroughly described, they have historically been a reliable source of medicine for the treatment of many different types of sickness. To determine the precise mechanism of action of medicinal plants with hypoglycemic and insulin-mimetic activities, further research must be done. It is a common misconception that plants are harmless, yet many plant products are poisonous to humans. As a result, toxicity studies of these plants should be clarified prior to their intake.

Chapter Six
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