Thesis On

Review paper on antidiabetic plant in Bangladesh

Submitted To

The Department of Pharmacy,

Faculty of Allied Health Sciences,

Daffodil International University

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

Submitted By

Student ID: 213-46-380

Batch: 13th

Department of Pharmacy

Faculty of Allied Health Sciences

Daffodil International University

December 2022

©Daffodil International University

APPROVAL

This thesis, Review paper on antidiabetic plant 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

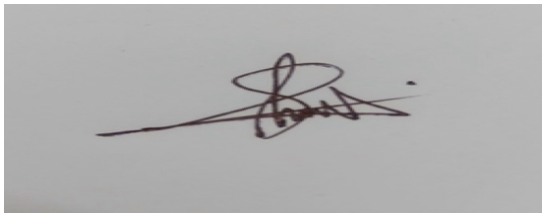
©Daffodil International University

DECLARATION

I hereby attest that I am the single author of this thesis and that no part of it, nor the entire thesis, has been submitted to any other university or institution for a degree.

I certify that the project report titled "Review paper on antidiabetic plant in Bangladesh" submitted to Daffodil International University's Department of Pharmacy is an original work completed by me under the supervision of Farjana Islam Aovi (Assistant professor, Department of pharmacy, Daffodil International University).

The facts and information included in the report are accurate to the best of my knowledge.



Sadia Afrin Shanchita ID: 213-46-380 Batch: 13th Department of Pharmacy Daffodil International University	Supervisor Farzana Islam Aovi Assistant Professor Department of Pharmacy Daffodil International University

©Daffodil International University

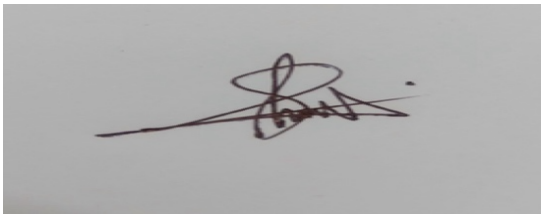
ACKNOWLEDGEMENT

I owe a great debt of gratitude to my honorable project supervisor, **Farjana Islam Aovi** Assistant professor, Department of Pharmacy, Daffodil International University, for her brilliant leadership and steady oversight, as well as for providing vital information about the project and assisting me in completing it.

I'd like to extend my heartfelt greetings to **Dr. Muniruddin Ahmed**, Professor and Head, Daffodil International University's Department of Pharmacy.

I'd also want to express my appreciation to all of the teachers at Daffodil International University's Pharmacy Department, as well as other members, for their great collaboration with us.

Finally, I'd want to convey my thanks to my parents and other family members for their unwavering support and encouragement in completing this project.



Sadia Afrin Shanchita

Author

©Daffodil International University

DEDICATION

I dedicate this work to Almighty Allah first, and then to my family, my teachers and friends.

©Daffodil International University

ABSTRACT

Diabetes mellitus, one of the most prevalent metabolic disorders, currently affects 2.8% of people worldwide, and by the year 2025, this percentage is projected to rise to 5.4%. Herbal cures have long been recognized as effective medical treatments, and they are now progressively playing a larger role in contemporary, high-tech medicine. The aim of this study was to determine whether or not Bangladesh uses anti-diabetic herbs. A literature review served as the analysis strategy in this investigation. The 15 papers being examined for this study were primarily written between the years of 1999 and 2022. Several websites, including Google Scholar and PubMed, were used to prepare the literature search for this investigation. The root (11%), the seed (11%), the complete plant (11%), the flower (3%), and the rhizome (1%), all components of the plant, the bark (9%), the stem (6%), the flower (3%), and the rhizome (1%). This review also explores how these plants' therapeutic properties can be used to treat diabetes mellitus. Clinical studies suggest that aloe vera gel may be a safe alternative to conventional antihyperglycemic and anti hypercholesterolemic medications for persons with type 2 diabetes. This is because it has little to no effect on other normal blood lipid levels or liver/kidney function. In a study, rabbits were fed aloe vera to investigate how it altered their fasting blood sugar levels. Aloe vera and glibenclamide both reduce blood sugar by 28% and 37%, respectively.

Keywords: Antidiabetic, Pharmacological, Hyperglycemia, Drug.

©Daffodil International University

Table of content

Chapter One: Introduction

S.I	Topic	Page No
1.1	Introduction	02-14

Chapter Two: Goal of my study

S.I	Topic	Page No
1.	The goal of my study	16-16

Chapter Three: Methodology

S.I	Topic	Page No
1.	Methodology	18-18

Chapter Four: Result and Discussion

S.I	Topic	Page No
1	Result and Discussion	20-24

Chapter Five: Conclusion

S.I	Topic	Page No
1.	Conclusion	26-26

Chapter Six: Reference

S.I	Topic	Page No
1.	Reference	28-34

©Daffodil International University

List Of Figures-

S.I	Figure name	Page No
1.	Effect of Aloe vera on Fasting Blood Glucose	24-24

List of Tables:-

S.I	Table name	Page No
1.	The proportion of antidiabetic plant components used to treat Diabetes in Bangladesh.	20-20
2.	The most typical conventional preparations of the highlighted plants.	21-21
3.	Wound-healing properties of A. Conyzoides	22-22
4.	Bioactive constituent(s) and Probable mechanisms of action of medicinal plants	23-23

©Daffodil International University

Chapter One:

Introduction

©DaffodIl InternatIonal UnIversIty

1.1.Diabetes

Hyperglycemia (high blood sugar levels) is a characteristic of the metabolic illness known as diabetes mellitus (or diabetes mellitus). Common symptoms include an increase in urine, thirst, and appetite. Uncontrolled Diabetes can lead to several serious consequences, some of which are fatal. Death, diabetic ketoacidosis, and hyperosmolar hyperglycemia are all possible acute outcomes of untreated Diabetes. Heart disease, stroke, chronic kidney disease, foot ulcers, nerve damage, eye damage, and cognitive impairment are only a few of the very serious long-term impacts [2]. [3] It's possible that the pancreas isn't making enough insulin or that the body's cells aren't utilizing the insulin produced as effectively as they should. A hormone called insulin helps glucose enter cells so that it may be used as fuel. Diabetes mellitus can have one of three forms: When beta cells in the pancreas start to go, the inability to produce enough insulin results in type 1 diabetes. Juvenile Diabetes or insulin-dependent diabetic Mellitus are no longer used terms to describe these conditions. When the immune system attacks the body, beta cells are killed. However, it is unknown what triggers this autoimmune reaction. Type 1 diabetes can occur in adults, but it typically strikes adolescents and teenagers. Insulin resistance, a condition where cells no longer respond to insulin as intended, is the underlying cause of type 2 diabetes. In the later stages of the disease, insulin insufficiency could appear. Previously, the medical term for this disorder was adult-onset Diabetes, also known as non-insulin-dependent diabetes mellitus. The majority of persons with type 2 diabetes are over 60, however younger people are now more frequently affected by the condition as a result of increased childhood obesity rates. Being overweight and being inactive are the most prevalent risk factors. The third of the major three is Diabetes, which often exclusively affects pregnant women who have never had the condition before. After giving birth, blood sugar levels in diabetic women frequently return to normal. Type 2 diabetes is more likely to strike women who have had gestational Diabetes in the future. Insulin injections are the only method of treatment for type 1 diabetes. Paying attention to dietary practices, physical activity levels, body mass index, and cigarette smoking are necessary for both preventing and managing type 2 diabetes. If you have type 2 diabetes, you may use oral antidiabetic drugs in place of or in addition to insulin to manage your disease. [4] People who have this condition should pay close attention to their feet and eyes, as well as take steps to control their blood pressure. When taking certain oral drugs like insulin, low blood sugar levels might be

©DaffodIl InternatIonal UnIversIty

dangerous (hypoglycemia). Obesity and type 2 diabetes patients may gain from bariatric surgery. [5-6] Many women who previously had type 2 diabetes no longer do so after giving baby. [7] 90% of the 463 million persons with Diabetes in 2019 had type 2 diabetes, which affects about 8.8% of the adult population worldwide. Men and women pay approximately identical rates. [8] The majority of individuals now anticipate future increases in interest rates. Your risk of dying young is at least doubled if you have Diabetes. Over 4.2 million individuals are anticipated to pass away this year due to Diabetes worldwide. why it is the sixth largest cause of mortality worldwide. [9-10] In 2017, it was predicted that diabetes-related medical costs will reach $727 billion globally. Nearly $327 billion was spent in the United States in 2017 as a result of Diabetes. [11] Diabetic patients typically pay 2.3% more for healthcare than the general population. [12]

1.2.History of Diabetes

Diabetes was one of the first diseases to be recorded; it was described in Egyptian literature from around 1500 BCE as "too much emptying of the urine" [13]. The Ebers papyrus advises consuming a certain liquid to reduce these symptoms. Most likely, the first instance of the disease to be identified and reported was type 1 diabetes. The condition was referred to as "honey urine" (or "madhumeha") by practitioners of traditional Indian medicine. Around 230 BCE, the Greek physician Apollonius of Memphis coined the name "diabetes." The word is Greek in origin and means "to pass through." Galen, one of the most well-known Roman doctors, claimed that during the course of his whole career, he had only seen two cases of the ailment. Other potential factors include a sedentary lifestyle and outdated food, as well as the late discovery of clinical symptoms. This ailment was known as "Diarrhea of the Urine" by Galen (diarrhea urinosa). [14-15] The first known treatise, written by Aretaeus of Cappadocia, offers a comprehensive examination of Diabetes (2nd or early 3rd century C.E.). He blamed the humid, heavenly environment of the "Pneumatic School" for the disease's signs and progression. He speculated that Diabetes was related to other illnesses and talked about separating the signs of Diabetes from those of snakebite, another likely cause of acute dehydration. Before his book's initial Latin publication in Venice in 1552, he was mostly unknown in the West. [16] Around 400–500 CE, Indian doctors Sushruta and Charaka distinguished between two types of Diabetes, one associated with youth and the other with obesity. The most effective diabetes treatment to date is insulin, which was created and

©DaffodIl InternatIonal UnIversIty

perfected by Canadian scientists Frederick Banting and Charles Herbert Best in 1921 and 1922. NPH, a very long-acting form of insulin, was created in the 1940s.

1.3. Types of Diabetes

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

Type 1 diabetes

An autoimmune disorder known as type 1 diabetes, or T1D, occurs when the body's immune system unintentionally assaults its own insulin-producing cells (beta cells). For cells to utilize glucose as fuel, they need the hormone insulin. In the event that no therapy is given, this results in hyperglycemia. [17] The most typical signs of high blood sugar include increased urination, thirst, hunger, and weight loss, all of which may be uncomfortable or even hazardous. [18] It may show up as fatigue, blurry vision, and slow wound healing. Most people have symptoms within a few weeks. Type 1 diabetes has no known direct cause, however environmental and genetic variables have both been linked to the disease (19). The pancreatic beta cells that produce insulin are attacked by and killed by the immune system. A blood test for sugar or glycated hemoglobin can identify diabetics (HbA1C). Autoantibody testing is crucial for accurately differentiating type 1 from type 2 diabetes. The majority of type 1 diabetes cases have no known preventive factors. Treatment with insulin is essential for survival. The insulin pump is an alternative to subcutaneous injections for those who require insulin therapy. [20] Regular exercise and healthy food are part of diabetes treatment. If Diabetes is not treated, diabetic complications may worsen. Diabetic ketoacidosis and nonketotic hyperosmolar coma are two outcomes that manifest quickly. Some of the long-term complications include cardiovascular disease, stroke, renal failure, foot ulcers, and eyesight loss. Consuming excessive amounts of insulin can result in dangerously low blood sugar

©Daffodil International University

levels since it reduces blood sugar. [21-13] Between 5 and 10 percent of people are thought to have type 1 diabetes overall. It is unclear exactly how many people are impacted. However, it is predicted that every [24] more than 80,000 kids worldwide contract the illness. Up to three million Americans could be impacted. Scandinavia and Kuwait saw closer to thirty new cases per 100,000 people annually, compared to roughly one new case per 100,000 people in East Asia and Latin America. [25] The majority of the time, younger people experience the start of symptoms.

Type 2 diabetes

The symptoms of type 2 diabetes, commonly known as adult-onset Diabetes, include excessive blood sugar, insulin resistance, and insufficient insulin production. Excessive urination, increased thirst, and unexplained weight loss are common symptoms. Additional signs could be an increase in hunger, excessive exhaustion, or an inability to heal wounds. Symptoms frequently worsen over time. Chronic effects of high blood sugar include heart disease, stroke, diabetes retinopathy-related blindness, kidney failure, and insufficient blood flow to the limbs that may require amputation. Despite the rarity of ketoacidosis, a hyperosmolar hyperglycemic condition can emerge quickly. Obesity or a lack of exercise are the two main risk factors for type 2 diabetes. Individuals have innate differences in sensitivity [26]. Type 2 diabetes makes up the great majority of diabetes diagnoses, with type 1 and pregnancy-related Diabetes making up the remaining 10%. Due to the destruction of their pancreatic beta cells, which create insulin, type 1 diabetes patients have a harder time maintaining adequate blood glucose levels. [27-28] Fasting plasma glucose, the oral glucose tolerance test, and glycated hemoglobin are examples of potential blood tests for diabetes diagnosis (A1C). Maintaining a healthy weight, engaging in regular exercise, and eating well can reduce or even eliminate the chance of developing type 2 diabetes (high in fruits and vegetables and low in sugar and saturated fats). The patient's food will be changed as part of the therapy, and she will also be urged to continue her exercise program. In the event that metformin is unable to lower blood sugar levels, insulin may be suggested as a substitute. A lot of people can require insulin injections. Some people who take oral medications might not require as frequent blood sugar checks as those who use insulin. Bariatric surgery typically benefits diabetic people. Since the 1960s, both the prevalence of type 2 diabetes and the obesity epidemic have skyrocketed. Approximately 392 million people have this diagnosis in 2015, up from 30 million in 1985. Although type 2 diabetes is growing increasingly prevalent in younger age groups, it typically does

©Daffodil International University

not manifest itself until middle age or later. Expect to live 10 years less than the average person if you have type 2 diabetes. [30] The earliest known written account of Diabetes was written in Egyptian literature around 1500 BCE. [31] Insulin's medicinal benefits were first understood in the 1920s. [32]

Gestational Diabetes

The medical name for high blood sugar levels that appear during pregnancy is gestational Diabetes. Although gestational Diabetes seldom causes symptoms, it may raise the risk of pre-eclampsia, depression, and the requirement for a C-section. Babies born to moms with poorly controlled gestational Diabetes were more likely to be large for gestational age at birth, to experience postnatal hypoglycemia, and to exhibit jaundice. Diabetes that is not managed raises the possibility of a stillbirth [33]. Particularly overweight kids are more likely to develop type 2 diabetes and obesity in the long run [34]. When either insulin resistance or decreased insulin production takes place during pregnancy, gestational diabetes results. Obesity, polycystic ovarian syndrome, pregnancy, and family history of the condition are all risk factors for developing Diabetes. Blood is drawn in order to make the diagnosis. It is advised to check pregnant women at average risk between the 24th and 28th week of pregnancy [35]. A high-risk pregnant woman may be examined as early as the first prenatal appointment, it has been suggested [36, 37]. Preventative measures, such as keeping a healthy weight and exercising frequently, may be helpful. In addition to a diabetic diet and regular exercise, controlling gestational Diabetes may necessitate the use of insulin injections. Most women's blood sugar levels can be controlled with dietary and activity changes. Four times a day, patients are recommended to check their blood sugar levels. After giving birth, breastfeeding should start as soon as is practical. In the study's sample of pregnant women, Diabetes affected 3-9% of them. The third trimester of pregnancy is when this frequently occurs [38]. It affects 13% of people over the age of 44 and just over 1% of people under the age of 20. Particular racial or ethnic groups are more at risk than others. This category includes people of Asian, American Indian, Indigenous Australian, and Pacific Islander descent. 90% of the time, gestational Diabetes disappears after delivery. Nevertheless, women are more likely than men to get type 2 diabetes [39].

©DaffodIl InternatIonal UnIversIty

Latent Autoimmune Diabetes in Adults (LADA)

The signs and symptoms of type 1 and type 2 diabetes are identical in latent autoimmune Diabetes in adults (LADA), also known as slowly developing immune-mediated Diabetes (T2D). People with LADA frequently exhibit insulin resistance similar to individuals with type 2 diabetes (T2D), and they also share several risk factors for T2D. The study found that individuals with LADA have antibodies against the cells that produce insulin, and that this slows down the rate at which these cells quit producing insulin when compared to individuals with T1D. [40] Despite being genetically different from both T1D and T2D, it appears that LADA shares risk factors with both diseases. According to reports, insulin resistance and autoimmune disease in LADA patients can range from mild to severe, demonstrating genetic and phenotypic variability. LADA's shared genotype and phenotype, along with its intraclinical variation in autoimmune and insulin resistance, imply that it may be seen of as a hybrid form of type 1 and type 2 diabetes. The name LADA, coined in 1993[41], is not recognized by the International Diabetes Federation or the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, both of which include type 1 diabetes in their common definitions.

1.4.Diabetes Symptoms

A) Frequently urinate (pee), often during the night B) abjectly starving

C) Cloudy eyesight.

D) Having tingly or numb hands and feet.

E) Feeling extremely exhausted F) having very dry skin

G) Wounds that progress steadily yet slowly

H) A higher than usual number of illnesses

©DaffodIl InternatIonal UnIversIty

1.5.Causes

Causes type 1 diabetes

When the beta cells in the pancreas that make insulin are attacked and destroyed by the immune system, which acts as the body's line of defense against infection, type 1 diabetes results. Environmental variables, including infections and genetic predispositions, may hasten the onset of type 1 diabetes, according to scientists [42].

Causes type 2 diabetes

The most prevalent type of Diabetes, type 2, has a number of genetic and environmental causes.

Overweight, obese, and physically inactivity

The likelihood of developing type 2 diabetes rises with inactivity, weight gain, and obesity. Insulin resistance is a common complication of type 2 diabetics' weight issues. The distribution of fat throughout the body has an impact on the outcomes as well. An increased risk of type 2 diabetes, insulin resistance, and cardiovascular disease has been associated with excess abdominal fat. Based on your current weight, use these Body Mass Index (BMI) statistics to estimate your level of risk for type 2 diabetes. [43]

Insulin resistance

The first sign of type 2 diabetes is frequently insulin resistance, a condition in which the body's muscle, liver, and fat cells do not react to insulin as they should. Your body consequently requires extra insulin to facilitate glucose uptake into cells. An increase in the need for insulin causes the pancreas to produce more of the hormone. The inability of the pancreas to produce enough insulin over time raises blood glucose levels.

Genes and family history

Similar to type 1 diabetes, type 2 diabetes may be more likely to develop if you have specific genes. The illness, which typically runs in families, affects these racial/ethnic groups more frequently than others:

- Black Americans
- Native Alaskans

©DaffodIl InternatIonal UnIversIty

- Indian Americans
- American Asians
- Hispanics/Latinos
- Hawaiian natives
- Caribbean Islanders

Genes may also increase a person's likelihood of being overweight or obese, which increases their risk of developing type 2 diabetes.

Causes of gestational

Gestational Diabetes is thought to have hormonal changes related to pregnancy as its primary causes, in addition to hereditary and environmental factors.

Insulin resistance

Due to placental hormones, insulin resistance is prevalent in late pregnancy. Sadly, some pregnant women do not produce enough insulin to properly address their insulin resistance. When the pancreas does not make enough insulin, gestational Diabetes develops. Similar to type 2 diabetes, pregnancy-related Diabetes is linked to weight gain. Insulin resistance may already exist in obese or extremely overweight females. It's also possible that overeating while pregnant is a contributing factor. [44-46]

©DaffodIl InternatIonal UnIversIty

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)

©DaffodIl InternatIonal UnIversIty

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

Patients with Diabetes must strictly follow their medication regimens. Diabetes should never be ignored because the consequences could be catastrophic. The need for toe or foot amputation, blindness, renal failure (or other organ failure), and even death are possible complications. If you have Diabetes, taking your medication as prescribed can significantly lower your risk of developing a diabetic complication. A combination of medications, dietary changes, and increased physical activity is used as treatment. Among the options for managing Diabetes are pills, insulin, and other injectable medications. For people with type 1 diabetes, insulin injections are a constant necessity. Despite the fact that many people with type 2 diabetes can manage their blood sugar levels with oral medications, some may eventually require 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:

©DaffodIl InternatIonal UnIversIty

- A type 1 diabetes diagnosis is made when the pancreas stops producing insulin. Everyone is at risk, but children and teenagers are especially weak. People with type 1 diabetes need to take insulin to preserve their health.
- Although type 2 diabetes is the most prevalent, there are other types as well. In people with type 2 diabetes, insulin production declines and insulin resistance emerge. Adults are disproportionately affected, especially the overweight. The increased risk of developing type 2 diabetes, however, does not only apply to the elderly.
- One type of Diabetes that only manifests during pregnancy is gestational Diabetes. Fortunately, the majority of women say that their symptoms disappear after delivering delivery. Women who had gestational Diabetes had a greater lifetime risk of developing type 2 diabetes. There are numerous medication classes that can be prescribed for medicinal purposes. Although it is not required to recall all the names and technical terms, we should be aware of the fact that there are alternatives because the sheer number of them may be overwhelming. [51-52]

1.8.Plants

Most of the energy required by members of the eukaryotic kingdom Plantae comes from sunlight. Once upon a time, the plant kingdom was thought to include all animals not included in the animal world. However, current definitions of Plantae do not include prokaryotes and some types of algae (the archaea and bacteria). One group of plants is known as Viridiplantae, which is Latin for "green plants," and is related to Glaucophyta. It includes green algae and Embryophyta (land plants). The second category of plants includes ferns, hornworts, liverworts, trees, flowers, and mosses. The majority of plant species are multicellular creatures. The majority of the energy needed for green plants comes from photosynthesis, which is carried out by primary chloroplasts produced through an endosymbiotic relationship with cyanobacteria. They have a distinctive green color because of the presence of chlorophylls a and b in their chloroplasts. Although parasitic or mycotrophic plants can produce blooms, fruit, and seeds, these plants cannot grow normally since they lack chlorophyll and photosynthesis. Even though asexual reproduction is frequently found in plants, sexual reproduction and generational alternation are characteristics of plant life. Of the 320 000

©DaffodIl InternatIonal UnIversIty

plant species that are currently known, somewhere between 260.000 and 290.000 yield viable seed. [53] Green plants offer a sizeable amount of the world's food supply in addition to the molecular oxygen required for the majority of Earth's ecosystems to function. Since they are necessary for a balanced diet, humans have been farming grains, fruits, and vegetables for eons. Plants have been used by humans for a wide range of purposes since the beginning of time, including but not limited to food, medicine, clothing fiber, and paper. Botany is a discipline of biology that studies plants and their surroundings. [54]

1.9.Medicinal plants

Traditional medical practices have placed a strong emphasis on finding and using medicinal plants, also referred to as medicinal herbs, since ancient times. Plants produce a wide variety of chemicals for a variety of purposes, including protection against herbivorous animals, insects, fungi, and illnesses. The identification of numerous phytochemicals with known or anticipated biological functions has occurred recently. The benefits of employing the entire plant as a treatment remain unclear because a single plant may contain a range of phytochemicals. The phytochemical makeup and pharmacological activity, if any, of many plants with potential as medicines have not been well studied by science. [55] Clay tablets with information on hundreds of medicinal plants, including opium, were left behind by the Sumerian civilization, which peaked around 3000 B.C. A list of about 850 plant remedies can be found in the Ebers Papyrus, which was recorded in ancient Egypt around 1550 B.C. The treatise De materia medica, written by the Greek physician Dioscorides in the year 60 AD while he was serving in the Roman army, served as the foundation for pharmacopeias over the following 1500 years. As a result of ethnobotanical studies conducted as part of drug development efforts, hundreds of chemicals with pharmacological action have been found. Aspirin, digoxin, quinine, and opium are typical medications. There may be a vast range of molecular types in plants. Four biochemical categories—alkaloids, glycosides, polyphenols, and terpenes—are in which they are classified. Due to their low cost and wide availability, medicinal plants are frequently employed in nations that have not yet developed a manufacturing sector. In 2012, it was predicted that the yearly export value of the numerous plant species with therapeutic properties was US$2.2 billion. [56] As of 2017, it was anticipated that the global market for plant-

©DaffodIl InternatIonal UnIversIty

based medicines and extracts will be worth billions of dollars. The World Health Organization (WHO) has set up a network to promote the responsible and healthy use of traditional medicine due to the lack of regulation in some nations. Over-collection to satisfy commercial demand is a specific concern for medicinal plants, in addition to general problems like climate change and habitat loss.

©DaffodIl InternatIonal UnIversIty

Chapter Two:

The Goal of My studies

©DaffodIl InternatIonal UnIversIty

Diabetes is a chronic condition that makes it harder for your body to turn food into usable energy. Your body absorbs the majority of the food you eat after it has been converted to glucose. Insulin is secreted by the pancreas in response to an increase in blood sugar levels. Using certain plants that have an impact on the body's glucose metabolism can help manage diabetes mellitus. Except for insulin, pramlintide, and other GLP receptor agonists, all of these medications must be taken orally and are sometimes referred to as oral hypoglycemic medications or oral antihyperglycemic medications.

My aim of this study is,

- To the bioactive compound to management of diabetes.
- To determine which plant possesses anti-diabetic qualities.
- To provide an overview of the plant's use in treating Diabetes.
- In relation to the percentage of plant compounds used to treat Diabetes in Bangladesh.
- To establish a new field of higher education.

©DaffodIl InternatIonal UnIversIty

Chapter Three:

Methodology

©DaffodIl InternatIonal UnIversIty

3.1. Introduction:

A literature review leads the examination. Around 15 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.

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 1999 to 2022.

3.4. Ethical Considerations

Before beginning the information assortment, educated verbal permission was taken from the investigation members. The obscurity of the respondents was kept private, and study subjects were educated that they could have the option to leave the program at any.

©DaffodIl InternatIonal UnIversIty

Chapter Four:
Result and Discussion

©DaffodIl InternatIonal UnIversIty

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

Traditional methods of treating hyperglycemia are frequently simpler, less expensive, and produced from readily available herbs that have hypoglycemic characteristics locally. One of the few herbal remedies with antidiabetic effects that generated a lot of research interest. They are *Mangifera indica L., Centella Asiatica L., Terminalia chebula L., Ficus racemose L., Ficus hispida L.f., and Momordica charantia L. Coccinia cordifolia L. Cogn, Aegle marmelos L. Corrêa, Coccinia grandis L. Voigt F. Hook, and Thoms are the three corticolous Tinospora species. Tamarindus indica L., Bombax ceiba L., Trigonella foenum-graecum L., Kalanchoe pinnata (Lamk.) Pers., Cajanus cajan L. Millsp., and Clerodendrum viscosum Vent.* The entire plant is studied for potential antidiabetic properties, including the leaf, fruit, flower, root, bark, rhizome, bulb, latex, and seed. The plant's leaf, used 32% of the time, is followed in terms of frequency of use by the fruit (14%), the entire plant (12%), the root (11%), the seed (11%), the bark (9%), the stem (6%), the flower (3%), and the rhizome (1%). [57][58].

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.

©Daffodil International University

4.2. Long-standing usage as an effective diabetes treatment

Several plant parts, including leaves, barks, seeds, fruits, stems, flowers, and in some cases, entire plants, are used to treat Diabetes, according to a thorough review of the literature. Most plants are used with water and consumed first thing in the morning. These formulas are provided in Table 2 [59][60].

Plants Name	Family	The formulation used in local areas of Bangladesh
A. paniculata	Acanthaceae	Drugs derived from the entire plant are frequently used to treat diabetes. 5 mg of the crude paste extract from the entire plant is taken in the morning before breakfast.
A. conyzoides	Asteraceae	Every day, two spoonfuls of the macerated form of the entire plant are consumed.
S. chirata	Gentianaceae	A mixture of honey and chirata root is used to treat diabetes. It is taken every morning in doses of 1-2 g.
T. arjuna	Combretaceae	Consume 3-6 g of powdered or macerated Berks with milk two hours after eating.
A.indica	Meliaceae	The water-based leaf extract paste should be taken twice to three times daily on an empty stomach.

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

©Daffodil International University

4.3. Hypoglycemic effects of *A. paniculate*

According to reviewing several articles, the Aqueous A. paniculata extract may have inhibited glucose-induced hyperglycemia in normal rabbits but had no effect on epinephrine-induced hyperglycemia. After six weeks of consistent dosing, there is no change in the blood glucose level in the fasted state. However, various studies have demonstrated that A. paniculata and andrographolide can produce hypoglycemia effects by obstructing the alpha-amylase and alpha-glucosidase enzymes. In alloxan-induced diabetic rats, a potent antidiabetic efficacy was demonstrated by re-establishing the impaired estrous cycle state [61][62].

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

Normal wounds can acquire secondary infections and take a long time to heal, making it challenging for diabetic people to heal them. According to an analysis of several studies, the excision wound model is frequently employed to quantify wound-healing activities. After treating the model with plant extract and distilled water, it was found that 72% of the wounds in the group treated with the plant extracts had healed, whereas more than 90% of the wounds in the group had done so [63][64].

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*

©Daffodil International University

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

The results of the study imply that tulsi and neem leaves may be used to treat people who have Diabetes and high blood pressure by reducing their symptoms and blood pressure. There was no noticeable difference in the individuals' anthropometric measurements after tulsi and neem leaf powder were added to their diets. The aqueous leaf extract significantly lowers blood sugar levels in both healthy and alloxan-induced diabetic rats [65]. In diabetic and hypoglycemic rats, it also reduces total cholesterol, uric acid, fasting blood sugar, and hypolipidemia. [66] Only a few of the main effects include antioxidant, antibacterial, antifungal, antiviral, anti-asthmatic, antistress, anticancer, involvement of stomach ulcer, antimutagenic, and immunostimulant properties [67].

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 [68].

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

©Daffodil International University

4.7. Effect of Aloe vera on fasting blood glucose levels (mg/dl) in control and experimental rabbits

According to clinical studies, aloe vera gel may serve as a secure antihyperglycemic and anti hypercholesterolemic medication in people with type 2 diabetes without significantly affecting other normal blood lipid levels or liver/kidney function. Aloe vera was given to rabbits in a study to see how it affected their fasting blood glucose levels. The blood glucose-lowering effects of aloe vera and glibenclamide are both 28% and 37%, respectively [69–70].

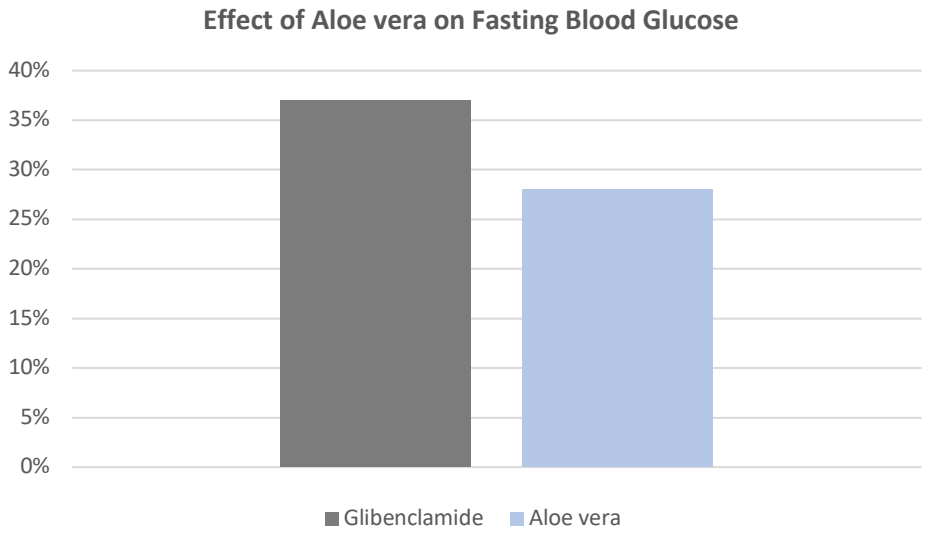


Fig 1: Effect of Aloe vera on Fasting Blood Glucose

©Daffodil International University

Chapter Five:

Conclusion

©DaffodIl InternatIonal UnIversIty

A list of antidiabetic herbs used to treat diabetes mellitus has been presented by the study. It demonstrates that these herbs have hypoglycemic characteristics and can be used to treat many secondary issues associated with diabetes mellitus. Historically, plants have been a reliable source of medicine for the treatment of a wide variety of illnesses, even if many of the therapeutic compounds collected from them have not yet been fully characterized. Further investigation is required to pinpoint the precise mechanism of action of therapeutic plants with hypoglycemic and insulin-mimetic properties. Despite the widespread belief that plants are safe for humans, many of their products are really harmful. Therefore, before consuming these plants, toxicity research on them should be elucidated.

©DaffodIl InternatIonal UnIversIty

Chapter Six:

Reference:

©DaffodIl InternatIonal UnIversIty

1. "Diabetes ."www.who.int. Retrieved Oct 1, 2022.
2. Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN (July 2009). "Hyperglycemic crises in adult patients with diabetes". Diabetes Care. 32 (7): 1335–1343. doi:10.2337/dc09-9032. PMC 2699725. PMID 19564476. Archived from the original on 2016-06-25.
3. Krishnasamy S, Abell TL (July 2018). "Diabetic Gastroparesis: Principles and Current Trends in Management". Diabetes Therapy. 9 (Suppl 1): 1–42. doi:10.1007/s13300-018-0454-9. PMC 6028327. PMID 29934758.
4. "The top 10 causes of death Fact sheet N°310". World Health Organization. October 2013. Archived from the original on May 30 2017.
5. Rippe RS, Irwin JM, eds. (2010). Manual of intensive care medicine (5th ed.). Wolters Kluwer Health/Lippincott Williams & Wilkins. p. 549. ISBN 978-0-7817-9992-8.
6. Picot J, Jones J, Colquitt JL, Gospodarevskaya E, Loveman E, Baxter L, Clegg AJ (September 2009). "The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation". Health Technology Assessment. 13 (41): 1–190, 215–357, iii-iv. doi:10.3310/hta13410. hdl:10536/DRO/DU:30064294. PMID 19726018.
7. Cash J (2014). Family Practice Guidelines (3rd ed.). Springer. p. 396. ISBN 978-0-8261-6875-7. Archived from the original on Oct 31 2015.
8. Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, et al. (December 2012). "Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010". Lancet. 380 (9859): 2163–2196. doi:10.1016/S0140-6736(12)61729-2. PMC 6350784. PMID 23245607.
9. "What is Diabetes?". Centers for Disease Control and Prevention. Mar 11 2020. Retrieved May 18 2020.
10. "The top 10 causes of death". www.who.int. Retrieved May 18 2020.
11. American Diabetes Association (May 2018). "Economic Costs of Diabetes in the U.S. in 2017". Diabetes Care. 41 (5): 917–928. doi:10.2337/dci18-0007. PMC 5911784. PMID 29567642.
12. "Deaths and Cost | Data & Statistics | Diabetes | CDC". cdc.gov. Feb 20 2019. Retrieved Jul 2 2019.

©DaffodIl InternatIonal UnIversIty

13. Ripoll BC, Leutholtz I (2011-04-25). Exercise and disease management (2nd ed.). Boca Raton: CRC Press. p. 25. ISBN 978-1-4398-2759-8. Archived from the original on 2016-04-03.
14. Poretsky L, ed. (2009). Principles of diabetes mellitus (2nd ed.). New York: Springer. p. 3. ISBN 978-0-387-09840-1. Archived from the original on 2016-04-04.
15. Roberts J (2015). "Sickening sweet". Distillations. Vol. 1, no. 4. pp. 12–15. Retrieved Mar 20 2018.
16. Laios K, Karamanou M, Saridaki Z, Androutsos G (2012). "Aretaeus of Cappadocia and the first description of diabetes" (PDF). Hormones. 11 (1): 109–113. doi:10.1007/BF03401545. PMID 22450352. S2CID 4730719. Archived (PDF) from the original on 2017-01-04.
17. "Diabetes Blue Circle Symbol". International Diabetes Federation. Mar 17 2006. Archived from the original on Aug 5 2007.
18. "Diabetes". www.who.int. Retrieved Oct 1 2022.
19. Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN (July 2009). "Hyperglycemic crises in adult patients with diabetes". Diabetes Care. 32 (7): 1335–1343. doi:10.2337/dc09-9032. PMC 2699725. PMID 19564476. Archived from the original on 2016-06-25.
20. Krishnasamy S, Abell TL (July 2018). "Diabetic Gastroparesis: Principles and Current Trends in Management". Diabetes Therapy. 9 (Suppl 1): 1–42. doi:10.1007/s13300-018-0454-9. PMC 6028327. PMID 29934758.
21. Saedi E, Gheini MR, Faiz F, Arami MA (September 2016). "Diabetes mellitus and cognitive impairments". World Journal of Diabetes. 7 (17): 412–422. doi:10.4239/wjd.v7.i17.412. PMC 5027005. PMID 27660698.
22. Chiang JL, Kirkman MS, Laffel LM, Peters AL (July 2014). "Type 1 diabetes through the life span: a position statement of the American Diabetes Association". Diabetes Care. 37 (7): 2034–2054. doi:10.2337/dc14-1140. PMC 5865481. PMID 24935775.
23. "Causes of Diabetes". National Institute of Diabetes and Digestive and Kidney Diseases. June 2014. Archived from the original on Feb 2 2016. Retrieved Feb 10 2016.
24. Heinrich J, Yang BY (January 2020). "Ambient air pollution and diabetes: a systematic review and meta-analysis". Environmental Research. 180: 108817.

©DaffodIl InternatIonal UnIversIty

Bibcode:2020ER....180j8817Y. doi:10.1016/j.envres.2019.108817. PMID 31627156. S2CID 204787461. Retrieved Apr 21 2022.

25. Ripsin CM, Kang H, Urban RJ (January 2009). "Management of blood glucose in type 2 diabetes mellitus" (PDF). American Family Physician. 79 (1): 29–36. PMID 19145963. Archived (PDF) from the original on 2013-05-05.
26. Diabetes Fact sheet N°312". World Health Organization. August 2011. Archived from the original on Aug 26 2013. Retrieved 2012-01-09.
27. "Diabetes Blue Circle Symbol". International Diabetes Federation. Mar 17 2006. Archived from the original on Aug 5 2007.
28. "Diagnosis of Diabetes and Prediabetes". National Institute of Diabetes and Digestive and Kidney Diseases. June 2014. Archived from the original on Mar 6 2016. Retrieved Feb 10 2016.
29. Pasquel FJ, Umpierrez GE (November 2014). "Hyperosmolar hyperglycemic state: a historic review of the clinical presentation, diagnosis, and treatment". Diabetes Care. 37 (11): 3124–31. doi:10.2337/dc14-0984. PMC 4207202. PMID 25342831.
30. Fasanmade OA, Odeniyi IA, Ogbera AO (June 2008). "Diabetic ketoacidosis: diagnosis and management". African Journal of Medicine and Medical Sciences. 37 (2): 99–105. PMID 18939392.
31. "Causes of Diabetes". National Institute of Diabetes and Digestive and Kidney Diseases. June 2014. Archived from the original on Feb 2 2016. Retrieved Feb 10 2016.
32. Maruthur NM, Tseng E, Hutfless S, Wilson LM, Suarez-Cuervo C, Berger Z, Chu Y, Iyoha E, Segal JB, Bolen S (June 2016). "Diabetes Medications as Monotherapy or Metformin-Based Combination Therapy for Type 2 Diabetes: A Systematic Review and Meta-analysis". Annals of Internal Medicine. 164 (11): 740–51. doi:10.7326/M15-2650. PMID 27088241. S2CID 32016657.
33. "Diabetes Blue Circle Symbol". International Diabetes Federation. Mar 17 2006. Archived from the original on Aug 5 2007.
34. "Gestational Diabetes". NIDDK. September 2014. Archived from the original on Aug 16 2016. Retrieved Jul 31 2016.
35. Donovan PJ, McIntyre HD (October 2010). "Drugs for gestational diabetes". Australian Prescriber. 33 (5): 141–144. doi:10.18773/austprescr.2010.066.

©DaffodIl InternatIonal UnIversIty

36. Metzger BE, Coustan DR (August 1998). "Summary and recommendations of the Fourth International Workshop-Conference on Gestational Diabetes Mellitus. The Organizing Committee". Diabetes Care. 21 Suppl 2: B161-7. PMID 9704245. And the rest of the issue B1–B167.
37. American Diabetes Association (January 2004). "Gestational diabetes mellitus". Diabetes Care. 27 Suppl 1 (Supplement 1): S88-90. doi:10.2337/diacare.27.2007.s88. PMID 14693936.
38. White P (November 1949). "Pregnancy complicating diabetes". The American Journal of Medicine. 7 (5): 609–16. doi:10.1016/0002-9343(49)90382-4. PMID 15396063.
39. "Priscilla White - White Classification, Diabetes in Pregnancy". Archived from the original on 2017-03-02. Retrieved 2017-02-20.
40. "Diabetes Blue Circle Symbol". International Diabetes Federation. Mar 17 2006. Archived from the original on Aug 5 2007.
41. Carlsson, Sofia (2019). "Etiology and Pathogenesis of Latent Autoimmune Diabetes in Adults (LADA) Compared to Type 2 Diabetes". Frontiers in Physiology. 10: 320. doi:10.3389/fphys.2019.00320. ISSN 1664-042X. PMC 6444059. PMID 30971952.
42. Hu EA, Pan A, Malik V, Sun Q (March 2012). "White rice consumption and risk of type 2 diabetes: meta-analysis and systematic review". BMJ. 344: e1454. doi:10.1136/BMJ.e1454. PMC 3307808. PMID 22422870.
43. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT (July 2012). "Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy". Lancet. 380 (9838): 219–229. doi:10.1016/S0140-6736(12)61031-9. PMC 3645500. PMID 22818936.
44. Huang H, Yan P, Shan Z, Chen S, Li M, Luo C, et al. (November 2015). "Adverse childhood experiences and risk of type 2 diabetes: A systematic review and meta-analysis". Metabolism. 64 (11): 1408–1418. doi:10.1016/j.metabol.2015.08.019. PMID 26404480.
45. Zhang Y, Liu Y, Su Y, You Y, Ma Y, Yang G, et al. (November 2017). "The metabolic side effects of 12 antipsychotic drugs used for the treatment of schizophrenia on glucose: a network meta-analysis". BMC Psychiatry. 17 (1): 373. doi:10.1186/s12888-017-1539-0. PMC 5698995. PMID 29162032.

©Daffodil International University

46. "National Diabetes Clearinghouse (NDIC): National Diabetes Statistics 2011". U.S. Department of Health and Human Services. Archived from the original on Apr 17 2014. Retrieved Apr 22 2014.
47. Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia: Report of a WHO/IDF consultation (PDF). Geneva: World Health Organization. 2006. p. 21. ISBN 978-92-4-159493-6.
48. Vijan S (March 2010). "In the clinic. Type 2 diabetes". Annals of Internal Medicine. 152 (5): ITC31-15, quiz ITC316. doi:10.7326/0003-4819-152-5-201003020-01003. PMID 20194231.
49. Saydah SH, Miret M, Sung J, Varas C, Gause D, Brancati FL (August 2001). "Postchallenge hyperglycemia and mortality in a national sample of U.S. adults". Diabetes Care. 24 (8): 1397–1402. doi:10.2337/diacare.24.8.1397. PMID 11473076.
50. Haw JS, Galaviz KI, Straus AN, Kowalski AJ, Magee MJ, Weber MB, et al. (December 2017). "Long-term Sustainability of Diabetes Prevention Approaches: A Systematic Review and Meta-analysis of Randomized Clinical Trials". JAMA Internal Medicine. 177 (12): 1808–1817. doi:10.1001/jamainternmed.2017.6040. PMC 5820728. PMID 29114778.
51. Muttalib A, Kasetty M, Mar JY, Elseaidy T, Ashrafzadeh S, Hamdy O (August 2017). "Weight Management in Patients with Type 1 Diabetes and Obesity". Current Diabetes Reports. 17 (10): 92. doi:10.1007/s11892-017-0918-8. PMC 5569154. PMID 28836234.
52. American Diabetes Association (January 2019). "5. Lifestyle Management: Standards of Medical Care in Diabetes-2019". Diabetes Care. 42 (Suppl 1): S46–S60. doi:10.2337/dc19-S005. PMID 30559231.
53. "Numbers of threatened species by major groups of organisms (1996–2010)" (PDF). International Union for Conservation of Nature. Mar 11 2010. Archived (PDF) from the original on Jul 21 2011. Retrieved Apr 27 2011.
54. Field, C.B.; Behrenfeld, M.J.; Randerson, J.T.; Falkowski, P. (1998). "Primary production of the biosphere: Integrating terrestrial and oceanic components". Science. 281 (5374): 237–240. Bibcode:1998Sci...281..237F. doi:10.1126/science.281.5374.237. PMID 9657713. Archived from the original on Sept 25 2018. Retrieved Sept 10 2018.

©DaffodIl InternatIonal UnIversIty

55. "The worldwide trend of using botanical drugs and strategies for developing global drugs". BMB Reports. 50 (3): 111–116. doi:10.5483/BMBRep.2017.50.3.221. PMC 5422022. PMID 27998396.
56. "Medicinal and aromatic plants trade programme". Traffic.org. Archived from the original on Mar 1 2018. Retrieved Feb 20 2017.
57. Md. Masudur Rahman, Md. Josim Uddin, A. S. M. Ali Reza,1 Abu Montakim Tareq, Talha Bin Emran, and Jesus Simal-Gandara "Ethnomedicinal Value of Antidiabetic Plants in Bangladesh: A Comprehensive Review" 2021 Apr 8. doi: 10.3390/plants10040729.
58. Hossan M.S, Hanif A, Khan M., Bari S, Jahan R., Rahmatullah M. Ethnobotanical survey of the Rakhine tribe inhabiting the Chittagong hill tracts region of Bangladesh. Am. Eurasian J. Sustain. Agric. 2009;3:172–180.
59. Md. RajdoulaRafe "A review of five traditionally used antidiabetic plants of Bangladesh and their pharmacological activities" Asian Pacific Journal of Tropical Medicine Volume 10, Issue 10, October 2017, Pages 933-939.
60. S. Ahmad "Lokaj chikitsay vesaja udvid (Traditional treatments and medicinal plants)" Anupam Prokashni, Dhaka (2012), pp. 1-775.
61. M. Burhanuddin, M. Shamsuzzoha, A.H. Hussain "Hypoglycaemic effects of Andrographis paniculata Nees on non-diabetic rabbits Bangladesh Med Res Counc Bull, 20 (1) (1994), pp. 24-26"
62. R. Subramanian, M.Z. Asmawi, A. Sadikun "In vitro alpha-glucosidase and alpha-amylase enzyme inhibitory effects of Andrographis paniculata extract and andrographolide" Acta Biochim Pol, 55 (2) (2008), pp. 391-398
63. A.Z. Almagboul, A.A. Farroq, B.R. Tyagi "Antimicrobial activity of certain Sudanese plants used in folkloric medicine: screening for antibacterial activity" part II Fitoterapia, 56 (1985), pp. 103-109
64. K.F. Chah, C.A. Eze, C.E. Emuelosi, C.O. Esimone "Antibacterial and wound healing properties of methanolic extracts of some Nigerian medicinal plants" J Ethnopharmacol, 104 (1) (2006), pp. 164-167.
65. Shibly, A. Z., Zohora, F. T., Islam, M. S., & Islam, M. R. (2015). "A comprehensive review on ethno pharmacological antidiabetic potential of traditional ayurvedic plants of Bangladesh". Journal of Pharmacognosy and Phytochemistry, 4

©DaffodIl InternatIonal UnIversIty

66. Rai, V. A., Iyer, U., & Mani, U. V. (1997). “Effect of Tulasi (Ocimum sanctum) leaf powder supplementation on blood sugar levels, serum lipids and tissues lipids in diabetic rats. Plant foods for humannutrition” 50(1), 9-16.
67. Vats, V., Yadav, S. P., & Grover, J. K. (2004). “Ethanolic extract of Ocimum sanctum leaves partially attenuates streptozotocin-induced alterations in glycogen content andcarbohydrate metabolism in rats” Journal of ethnopharmacology, 90(1), 155-160.
68. Towhid Hasan, Marjia Sultana “Antidiabetic Potency of Bangladeshi Medicinal Plants” Journal of Ayurvedic and Herbal Medicine 2018; 4(1): 35-42.
69. H.F. Huseini, S. Kianbakht, R. Hajiaghaee, F.H. Dabaghian “Anti-hyperglycemic and anti-hypercholesterolemic effects of Aloe vera leaf gel in hyperlipidemic type 2 diabetic patients: a randomized double-blind placebo-controlled clinical trial Planta” Med, 78 (2012), pp. 311-316.
70. Ohno, M.; Shibata, C.; Kishikawa, T.; Yoshikawa, T.; Takata, A.; Kojima, K.; Akanuma, M.; Kang, Y.J.; Yoshida, H.; Otsuka, M. The flavonoid apigenin improves glucose tolerance through inhibition of microRNA maturation in miRNA103 transgenic mice. Sci. Rep. 2013.

©DaffodIl InternatIonal UnIversIty